PHOTOGRAPH THIS SHEET

DTIC FILE COPY

LEVEL

INVENTORY 1

AD-A227 179

DTIC ACCESSION NUMBER

IRP PHASE 1 - RS CHARLESTON AFB

DOCUMENT IDENTIFICATION

OCT 1983

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

DISTRIBUTION STATEMENT

ACCESSION FOR
NTIS GRA&I ☒
DTIC TRAC ☐
UNANNOUNCED ☐
JUSTIFICATION

BY
DISTRIBUTION/
AVAILABILITY CODES

DISTRIBUTION	AVAILABILITY AND/OR SPECIAL	
A-1		

DISTRIBUTION STAMP

DTIC COPY INSPECTED 4

DTIC ELECTE OCT 02 1990 S D E

DATE ACCESSIONED

DATE RETURNED

90 09 13 025

DATE RECEIVED IN DTIC

REGISTERED OR CERTIFIED NUMBER

PHOTOGRAPH THIS SHEET AND RETURN TO DTIC-FDAC

DTIC FORM 70A APR 87

DOCUMENT PROCESSING SHEET

PREVIOUS EDITIONS MAY BE USED UNTIL STOCK IS EXHAUSTED

AD-A227 179

INSTALLATION RESTORATION PROGRAM

PHASE I - RECORDS SEARCH

CHARLESTON AFB, SOUTH CAROLINA

PREPARED FOR

UNITED STATES AIR FORCE
AFESC/DEV
Tyndall AFB, Florida

and

HQ MAC/DEEV
Scott AFB, Illinois

OCTOBER 1983

ES ENGINEERING-SCIENCE

NOTICE

INSTALLATION RESTORATION PROGRAM
PHASE I: RECORDS SEARCH
CHARLESTON AFB, SOUTH CAROLINA

Prepared For

UNITED STATES AIR FORCE
AFESC/DEV
Tyndall AFB, Florida
and
HQ MAC/DEEV
Scott AFB, Illinois

October 1983

Prepared By

ENGINEERING-SCIECNE
57 Executive Park South, Suite 590
Atlanta, Georgia 30329
#36047

NOTICE

This report has been prepared for the United States Air Force by Engineering-Science for the purpose of aiding in the Air Force Installation Restoration Program. It is not an endorsement of any product. The views expressed herein are those of the contractor and do not necessarily reflect the official views of the publishing agency, the United States Air Force, nor the Department of Defense.

Copies of the report may be purchased from:

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161

Federal Government agencies and their contractors registered with Defense Technical Information Center should direct requests for copies of this report to:

Defense Technical Information Center
Cameron Station
Alexandria, Virginia 22314

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

LIST OF FIGURES

LIST OF FIGURES
(Continued)

LIST OF TABLES

EXECUTIVE SUMMARY

The Department of Defense (DOD) has developed a program to identify and evaluate past hazardous material disposal sites on DOD property, to control the migration of hazardous contaminants, and to control hazards to health or welfare that may result from these past disposal operations. This program is called the Installation Restoration Program (IRP). The IRP has four phases consisting of Phase I, Initial Assessment/Records Search; Phase II, Confirmation/Quantification; Phase III, Technology Base Development; and Phase IV, Operations. Engineering-Science (ES) was retained by the United States Air Force to conduct the Phase I, Initial Assessment/Records Search for Charleston AFB under Contract No. F08637-80-G0009-5000.

INSTALLATION DESCRIPTION

Charleston Air Force Base is located in Charleston County, South Carolina, approximately sixteen miles northwest of Charleston, South Carolina. The study area for this project included the main base comprised of 3,731 acres and four off-base areas which are under the jurisdiction of Charleston AFB. The areas are as follows:

North Auxiliary Air Field	2,391 acres total (2276.5 acres owned by Air Force, 114.5 acres easment.
Ground/Air Transmitter-Receiver Site	5 acres
North Charleston Air Station Site	24 acres
Defense Fuel Support Point (DFSP)	56 acres

Charleston AFB was activated as an Army Air Base in 1943. After the end of World War II, the City of Charleston resumed authority of base property. In 1952, a troop carrier operation was established by the Air Force west of previous military facilities. It was placed under the authority of the Air Transport Service. In 1966, the Air Transport Service was redesignated as the Military Airlift Command (MAC). Charleston AFB has remained a MAC base since that time. North Auxiliary Air Field, originally established in World War II, was acquired by Charleston Air Force Base in 1979.

ENVIRONMENTAL SETTING

Summary of Environmental Setting for Charleston AFB

The environmental setting data for the Charleston AFB and DFSP indicate the following data are important when evaluating past hazardous waste disposal practices.

1. The mean annual precipitation is 51.4 inches; the net precipitation is +8 inches and the 1-year 24-hour rainfall event is four inches. These data indicate an abundance of rainfall in excess of evaporation plus a potential for storms to create excessive runoff.

2. The soils on base are typically sand and sandy loam and normally are well drained, but shallow clays are present locally. In areas where the natural soils have been disturbed and/or removed as in landfills, the shallow clays would be altered or removed therefore the vertical and horizontal permeabilities would vary depending upon materials and compaction with the landfill. The shallow aquifer outcrops on the base with water-table levels as high as two feet below ground. These data indicate relatively permeable soils with high water tables.

3. The Cooper Formation, the major confining bed in the area, occurs at approximately 35 feet below ground. This fact indicates that ground water will normally discharge into nearby surface streams or breakout at springs within a local area.

4. The Tertiary limestone and sand aquifers underlying the Cooper Formation have lower hydraulic heads (static water levels) than

the hydraulic head within the shallow aquifer therefore a potential exists for vertical downward movement of water where the Cooper Formation is not totally confining. Even though the Tertiary aquifers contain brackish water there is the potential for leachate to impact these aquifers where access is possible through permeable zones of the Cooper Formation or through improperly constructed wells.

5. The Charleston AFB lies within two drainage basins, the Ashley River and the Cooper River, both of which are affected by salt-water tidal fluctuations. The DFSP lies solely within the Cooper River basin. These data indicate that the surface-water resources of the area are important for tidal water animal species in terms of a need for a delicate water quality balance and in terms of possible human consumption of the animals. This factor is important due to the interconnection of ground and surface water in terms of contaminants in ground water potentially moving to surface-water streams.

6. The Red-cockaded Woodpecker (a Federally-listed endangered species) and the American alligator (a Federally listed threatened species) inhabit selected small portions of the Charleston AFB. There are no endangered or threatened species on the DFSP property.

Environmental Setting for North Auxiliary Air Field

The environmental setting data for North Auxiliary Air Field indicate the following data are important when evaluating past hazardous waste disposal practices.

1. The mean annual precipitation is 46.37 inches; the net precipitation is +4 inches and the one-year 24-hour rainfall event is 3.3 inches. These data indicate a relative abundance of rainfall in excess of evaporation plus a potential for storms to create excessive runoff.

2. The soils on base are typically loamy sand with pebbles and gravel and are poorly drained. The Orangeburg Group sediments (unconfined and confined aquifers) outcrop on base with water-table levels moderately deep (30 to 100 feet). Perched water-table zones may exist on base as evidenced by wet-weather springs. Numerous intermittent streams originate in the wet-lands south of the runway. The soils in the wetlands are sandy and very permeable. These data indicate moderately permeable soils with low-water tables on a majority of the base, but very permeable soils with high water tables in the wetlands. These factors are important in that leachate if present will have more potential for movement in the sands of the wetland areas more so than in the Orangeburg Group sediments.

3. The ground water within the Orangeburg Group sediments and the alluvial deposits in the wetland areas may discharge into nearby streams. This fact indicates an interconnection between the ground and surface-water systems. This is important in asses-sing the movement of leachate from a waste site to nearby streams.

4. The confined aquifers (Black Mingo, Peedee and Middendorf Formations) underlying the Orangeburg Group aquifers have higher hydraulic heads (static water levels) than the hydraulic head within the confined portions of the Orangeburg Group underlying the base. Therefore, an upward vertical ground-water movement condition would prevent any potential contaminants from natural-ly reaching the Black Mingo, Peedee and Middendorf Formations. This is important in determining the vertical migration of any potential contaminants.

5. There are no Federally-listed endangered or threatened animal or plant species known to occur on the North Auxiliary Air Field.

METHODOLOGY

During the course of this project, interviews were conducted with base personnel (past and present) familiar with past waste disposal practices; file searches were performed for past hazardous waste activities; interviews were held with local, state and federal agencies; and field and helicopter reconnaissance inspections were conducted at past hazardous waste activity sites. Twenty-three sites were identified as potentially containing hazardous contaminants resulting from past activities (Figure 1 and Figure 2). These sites have been assessed using a Hazard Assessment Rating Methodology (HARM) which takes into account factors such as site characteristics, waste characteristics, potential for contaminant migration and waste management practices. The details of the rating procedure are presented in Appendix H and the results of the assessment are given in Table 1. The rating system is designed to indicate the relative need for follow-on action.

FINDINGS AND CONCLUSIONS

The following conclusions have been developed based on the results of the project team's field evaluation, review of base records and files and interviews with base personnel.

The areas determined to have a high potential for environmental contamination are as follows:

- Defense Fuel Supply Point Tank Farm Spill Site
- Landfill No. 4
- Fire Protection Training Area No. 3
- Landfill No. 1
- Fire Protection Training Area No. 1
- Landfill No. 3

The areas determined to have a moderate potential for environmental contamination are as follows:

- Entomology Shop (past)
- Dump Site
- Hardfill Area No. 3

FIGURE 1

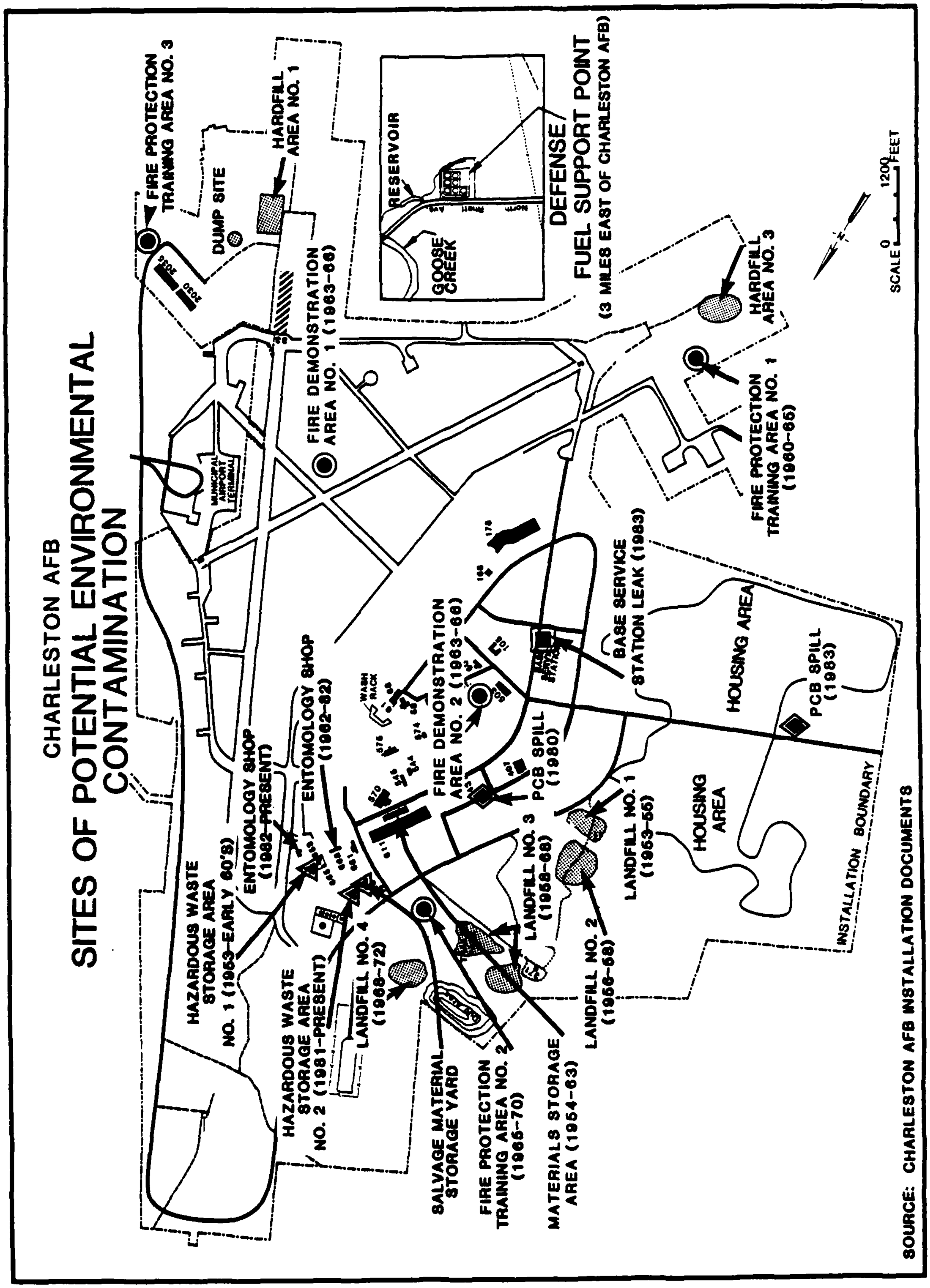
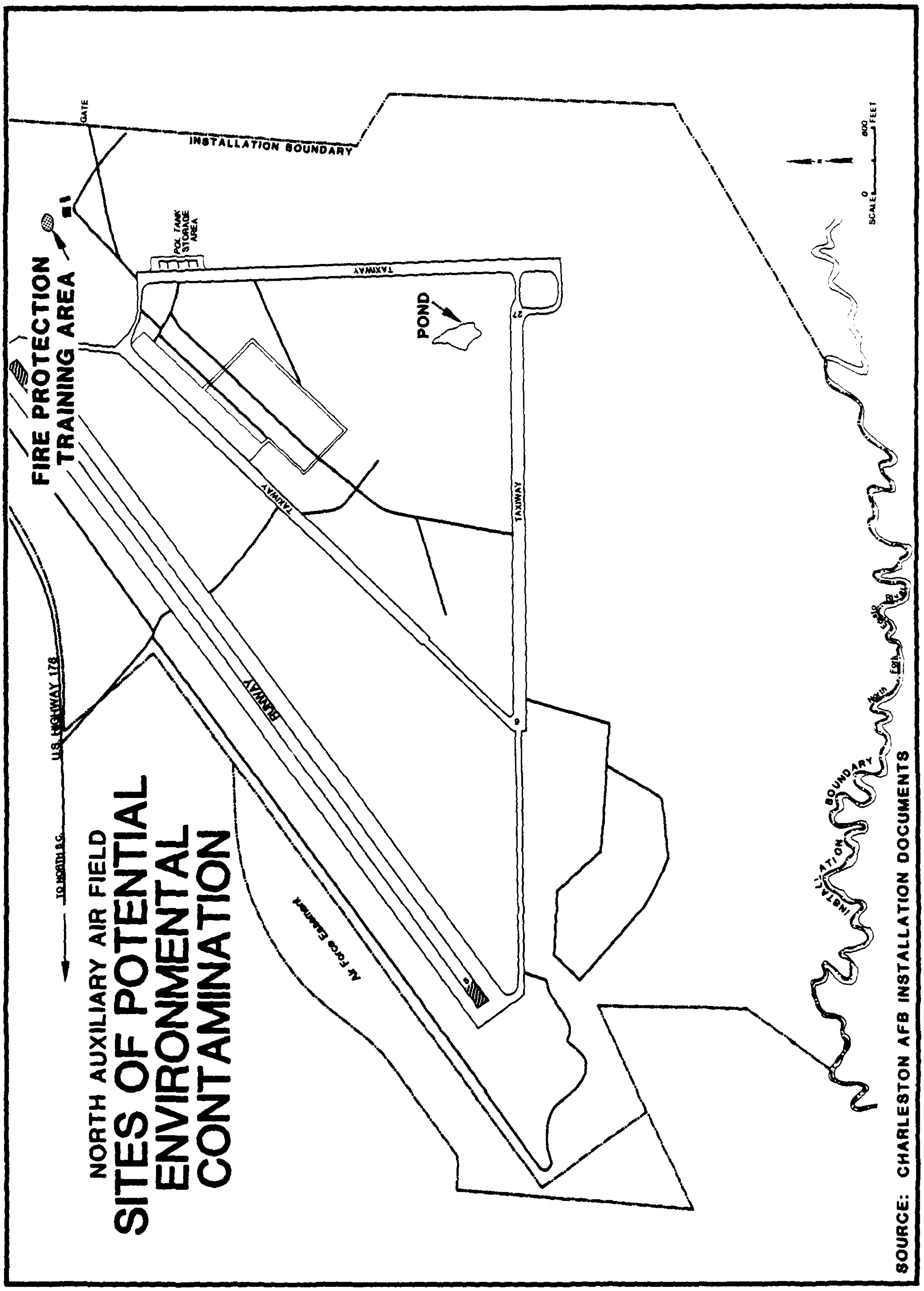

CHARLESTON AFB
SITES OF POTENTIAL ENVIRONMENTAL CONTAMINATION
FIRE PROTECTION TRAINING AREA NO. 3
DUMP SITE
HARDFILL AREA NO. 1
FIRE DEMONSTRATION AREA NO. 1 (1963-66)
MUNICIPAL AIRPORT TERMINAL
RESERVOIR
GOOSE CREEK
DEFENSE FUEL SUPPORT POINT
(3 MILES EAST OF CHARLESTON AFB)
HARDFILL AREA NO. 3
FIRE PROTECTION TRAINING AREA NO. 1 (1960-65)
SCALE 0 1200 FEET
HAZARDOUS WASTE STORAGE AREA NO. 1 (1963-EARLY 60'S)
ENTOMOLOGY SHOP (1982-PRESENT)
ENTOMOLOGY SHOP (1962-82)
WASH RACK
FIRE DEMONSTRATION AREA NO. 2 (1963-66)
BASE SERVICE STATION LEAK (1983)
HOUSING AREA
PCB SPILL (1983)
PCB SPILL (1980)
LANDFILL NO. 3 (1958-68)
LANDFILL NO. 1 (1953-55)
HOUSING AREA
INSTALLATION BOUNDARY
HAZARDOUS WASTE STORAGE AREA NO. 2 (1981-PRESENT)
LANDFILL NO. 4 (1968-72)
SALVAGE MATERIAL STORAGE YARD
FIRE PROTECTION TRAINING AREA NO. 2 (1966-70)
MATERIALS STORAGE AREA (1954-63)
LANDFILL NO. 2 (1956-58)
SOURCE: CHARLESTON AFB INSTALLATION DOCUMENTS

FIGURE 2


NORTH AUXILIARY AIR FIELD
SITES OF POTENTIAL ENVIRONMENTAL CONTAMINATION
FIRE PROTECTION TRAINING AREA
#1
POND
INSTALLATION BOUNDARY
GATE
POL TANK STORAGE AREA
TAXIWAY
RUNWAY
U.S. HIGHWAY 178
TO NORTH S.C.
Air Force Easement
SCALE
0
800
FEET
SOURCE: CHARLESTON AFB INSTALLATION DOCUMENTS

- Fire Protection Training Area No. 2
- Hardfill Area No. 1
- Base Gasoline Station Leak Site
- Hazardous Waste Storage Area No. 2
- Salvage Material Storage Yard
- Entomology Shop (present)
- Landfill No. 2
- Hazardous Waste Storage Area No. 1

The areas determined to have a low potential for environmental contamination are as follows:

- Fire Protection Training Area, North Auxiliary Air Field
- Fire Demonstration Area No. 2
- Fire Demonstration Area No. 1
- Materials Storage Area
- North PCB Spill Site
- South PCB Spill Site

RECOMMENDATIONS

Recommended guidelines for future land use restrictions at the twenty-three sites identified in Table 1 are presented in Chapter 6. The detailed recommendations developed for further assessment of environmental concern areas at Charleston AFB are also presented in Chapter 6. These recommendations are summarized as follows:

o Defense Fuel Support Point Tank Farm Spill Site	Conduct geophysical surveys, install monitoring wells, implement ground-water monitoring program and sample nearby surface water and existing wells.
o Landfill No. 4	Conduct geophysical surveys, install monitoring wells, implement ground-water monitoring program and sample nearby spring water and sediment.

TABLE 1

PRIORITY RANKING OF POTENTIAL CONTAMINATION SOURCES

Rank	Site Name	Date of Operation or Occurrence	Overall Total Score
1	Defense Fuel Supply Point Tank Farm Spill Site	1975	79
2	Landfill No. 4	1968-1972	71
3	Fire Protection Training Area No. 3	1970-present	69
4	Landfill No. 1	1953-1955	68
5	Fire Protection Training Area No. 1	1960-1965	68
6	Landfill No. 3	1958-1968	67
7	Entomology Shop (past)	1962-1982	66
8	Dump Site	present	65
9	Fire Protection Training Area No. 2	1965-1970	64
10	Fire Protection Training Area, North Auxiliary Air Field	present	64
11	Hardfill Area No. 3	1952-1965	64
12	Hardfill Area No. 1	1952-1973	60
13	Base Gasoline Station Leak Site	1983	60
14	Hazardous Waste Storage Area No. 2	1981-present	60
15	Salvage Material Storage Yard	present	60
16	Entomology Shop (present)	1982-present	60
17	Landfill No. 2	1956-1958	59
18	Hazardous Waste Storage Area No. 1	1953-early 1960's	58
19	Fire Demonstration Area No. 2	1963-1966	54
20	Fire Demonstration Area No. 1	1963-1966	53
21	Materials Storage Area	1954-1963	48
22	North PCB Spill Site	1980	6
23	South PCB Spill Site	1983	6

Note: This ranking was performed according to the Hazard Assessment Rating Methodology (HARM) described in Appendix H. Individual site rating forms are in Appendix I.

o Landfill No. 3	Conduct geophysical surveys, install monitoring wells, implement ground-water monitoring program and sample stream water and sediment between landfill and trailer park.
o Fire Protection Training Area No. 3	Conduct geophysical surveys, install monitoring wells, implement ground-water monitoring program and sample nearby stream water and sediment.
o Landfill No. 1	Conduct geophysical surveys, install monitoring wells, implement ground-water monitoring program and sample water and sediment in golf course stream.
o Fire Protection Training Area No. 1	Conduct geophysical surveys, install monitoring wells, implement ground-water monitoring program and sample water and sediment in Runway Creek.
o Entomology Shop (past)	Conduct geophysical surveys, install monitoring well and implement ground-water monitoring program.
o Dump Site	Conduct geophysical surveys, install monitoring wells and implement ground-water monitoring program.
o Hardfill Area No. 3	Conduct geophysical surveys, install monitoring wells and sample water and sediment in Runway Creek.
o Fire Protection Training Area No. 2	Conduct geophysical surveys, install monitoring wells and implement ground-water monitoring program.
o Hardfill Area No. 1	Conduct geophysical surveys, install monitoring wells and implement ground-water monitoring program.

o Base Gasoline Station Leak Site	Conduct geophysical surveys, install monitoring wells and implement ground-water monitoring program with new wells and existing wells.
o Hazardous Waste Storage Area No. 2	Conduct geophysical surveys, install monitoring wells, implement ground-water monitoring program, and sample nearby spring water.
o Salvage Material Storage Yard	Conduct geophysical surveys, install monitoring wells, and implement ground-water monitoring program.
o Entomology Shop (present)	Conduct geophysical surveys, install monitoring wells, and implement ground-water monitoring program.
o Landfill No. 2	Conduct geophysical surveys, install monitoring wells and sample and analyze ground-water and sediment in golf course stream.
o Hazardous Waste Storage Area No. 1	Conduct geophysical surveys, install sampling wells and implement ground-water monitoring program.

CHAPTER 1

INTRODUCTION

BACKGROUND AND AUTHORITY

The United States Air Force, due to its primary mission of defense of the United States, has long been engaged in a wide variety of operations dealing with toxic and hazardous materials. Federal, state, and local governments have developed strict regulations to require that disposers identify the locations and contents of disposal sites and take action to eliminate the hazards in an environmentally responsible manner. The primary Federal legislation governing disposal of hazardous waste is the Resource Conservation and Recovery Act (RCRA) of 1976, as amended. Under Section 6003 of the Act, Federal agencies are directed to assist the Environmental Protection Agency (EPA) and under Section 3012, state agencies are required to inventory past disposal sites and make the information available to the requesting agencies. To assure compliance with these hazardous waste regulations, Department of Defense (DOD) developed the Installation Restoration Program (IRP). The current DOD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated 11 December 1981 and implemented by Air Force message dated 21 January 1982. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the Installation Restoration Program. DOD policy is to identify and fully evaluate suspected problems associated with past hazardous contamination, and to control hazards to health and welfare that resulted from these past operations. The IRP will be the basis for response actions on Air Force installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, and clarified by Executive Order 12316.

PURPOSE AND SCOPE OF THE ASSESSMENT

The Installation Restoration Program has been developed as a four-phased program as follows:

Phase I	-	Initial Assessment/Records Search
Phase II	-	Confirmation/Quantification
Phase III	-	Technology Base Development
Phase IV	-	Operations (Remedial Actions)

Engineering-Science (ES) was retained by the Air Force Engineering and Services Center to conduct the Phase I Records Search at Charleston Air Force Base under Contract No. F08637-80-G0009-5000 using funding provided by the Military Airlift Command. This report contains a summary and an evaluation of the information collected during Phase I of the IRP. The land areas included as part of the Charleston AFB study were 3,731 acres of contiguous property, and the following additional sites:

North Auxiliary Air Field	A 2391-acre air base (2,276.5 owned, 114.5 easement) located approximately 85 miles northwest of Charleston AFB.
Ground/Air Transmitting and Receiving (GATR) Site	A five-acre communications facility located adjacent to Charleston AFB.
North Charleston Air Station	A 24-acre annex located adjacent to Charleston AFB.
Charleston Defense Fuel Support Point	A 56-acre fuel off-loading facility

The goal of the first phase of the program was to identify the potential for adverse environmental impacts from past waste management practices at Charleston AFB, and to assess the potential for contaminant migration. The activities undertaken in Phase I included the following:

- Review site records
- Interviews with personnel familiar with past generation and disposal activities

- Inventory of wastes
- Determination of estimated quantities and locations of current and past hazardous waste storage, treatment and disposal
- Definition of the environmental setting at the base
- Review past disposal practices and methods
- Conduct field evaluation
- Gather pertinent information from federal, state and local agencies
- Assess potential for contaminant migration
- Develop conclusions and recommendations for follow-on action

ES performed the on-site portion of the records search during June 1982. The following team of professionals were involved:

- E. J. Schroeder, Environmental Engineer and Project Manager, MSCE, 16 years of professional experience
- H. D. Harmon, Hydrogeologist, BS Geology, 8 years of professional experience
- R. E. Mayfield, Environmental Engineer, MS Civil Engineering, 5 years professional experience
- M. I. Spiegel, Environmental Scientist, BS Environmental Science, 5 years of professional experience
- L. E. Loven, Chemical Engineer, BSChE, 1 year of professional experience

More detailed information on these five individuals is presented in Appendix A.

METHODOLOGY

The methodology utilized in the Charleston AFB Records Search began with a review of past and present industrial operations conducted at the base. Information was obtained from available records such as shop files and real property files, as well as interviews with past and present base employees from the various operating areas. Those interviewed included personnel associated with the Civil Engineering Squadron, Bio-environmental Engineering Services, Maintenance Squadrons, Fuels Management, Transportation Squadron, and tenant organizations. Interviews were conducted with 82 individuals from the base to obtain the needed past activity information. A listing of Air Force interviewees by position and approximate period of service is presented in Appendix B.

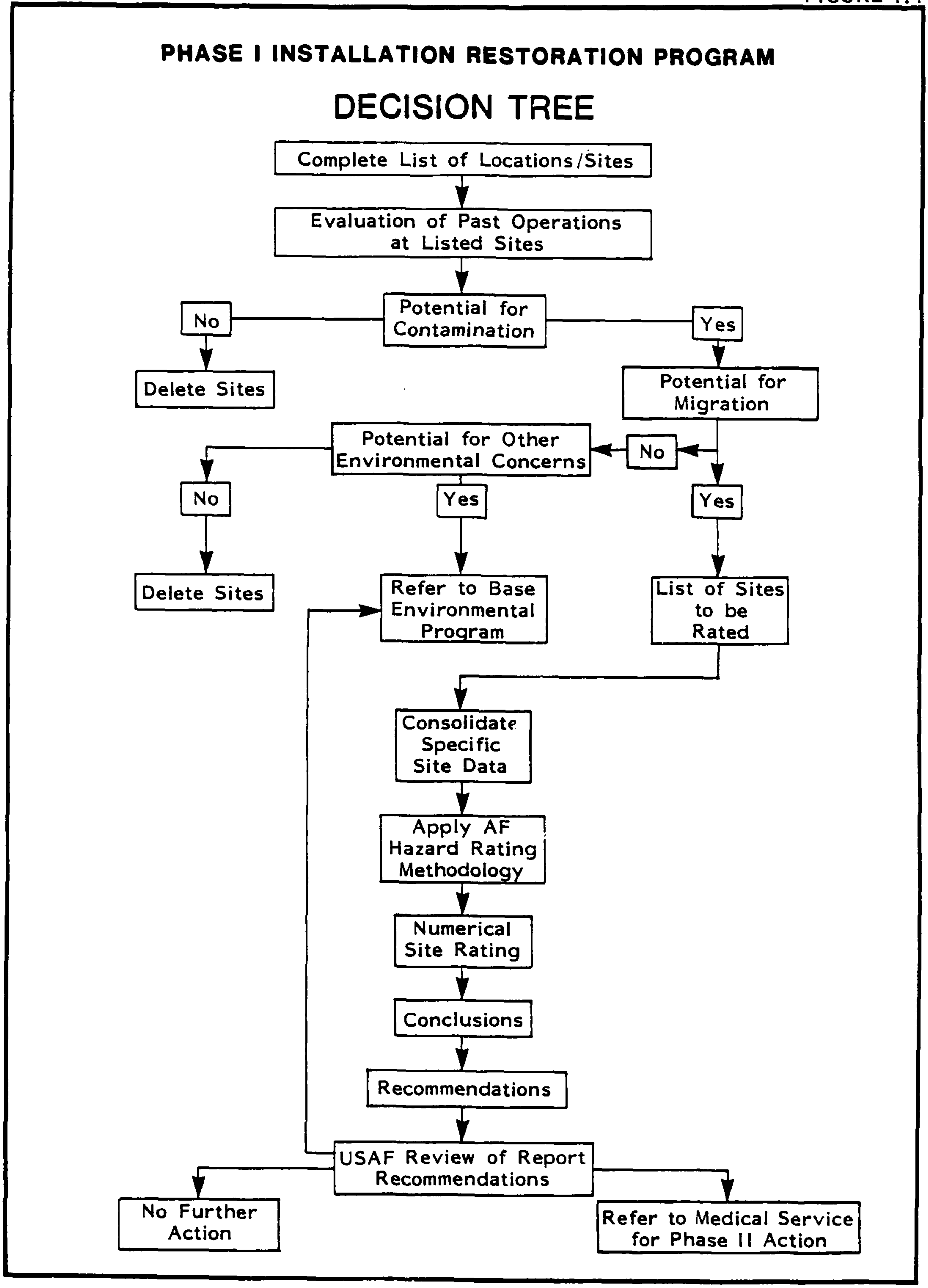
Concurrent with the base interviews the applicable federal, state and local agencies were contacted for pertinent base related environmental data. The 19 agencies contacted and interviewed are listed below as well as in Appendix B.

- Charleston County Department of Environmental Health
- Charleston Public Works Commission
- City of Charleston Archives
- North Charleston Department of Public Works
- South Carolina Coastal Council
- South Carolina Department of Health and Environmental Control
- South Carolina Department of Health and Environmental Control, Ground Water Protection Division
- South Carolina Department of Health and Environmental Control, Stream and Facility Monitoring Division
- South Carolina Geological Survey
- South Carolina Land Resources Conservation
- South Carolina Water Resources Commission, Charleston
- South Carolina Water Resources Commission, Columbia
- South Carolina Wildlife and Marine Resources Department
- U.S. Defense Logistics Agency
- U.S. Department of Agriculture, Soil Conservation Service, Orangeburg
- U.S. Department of Agriculture, Soil Conservation Service, Walterboro
- U.S. Department of Housing and Urban Development
- U.S. Geological Survey, Water Resources Division
- U.S. Environmental Protection Agency, Region IV

The next step in the activity review was to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from the various operations on the base. Included in this part of the activities review was the identification of all known past disposal sites and other possible sources of contamination such as spill areas.

A general ground and helicopter tour of the identified sites was then made by the ES Project Team to gather site specific information including (1) visual evidence of environmental stress, (2) the presence of nearby drainage ditches or surface-water bodies, and (3) visual inspection of these water bodies for any obvious signs of contamination or leachate migration.

A decision was then made, based on all of the above information, whether a potential exists for hazardous material contamination at any of the identified sites using the decision tree shown in Figure 1.1. If no potential exists, the site was deleted from further consideration. For those sites where a potential for contamination was identified, a determination of the potential for migration of the contamination was made by considering site-specific conditions. If there was no further environmental concern, then the site was deleted. If the potential for contaminant migration was considered significant, then the site was evaluated and prioritized using the Hazard Assessment Rating Methodology (HARM). A discussion of the HARM system is presented in Appendix H. The sites that were evaluated using the HARM procedures were also reviewed with regard to future land use restrictions.


PHASE I INSTALLATION RESTORATION PROGRAM
DECISION TREE
Complete List of Locations/Sites
Evaluation of Past Operations at Listed Sites
Potential for Contamination
No
Yes
Delete Sites
Potential for Migration
Potential for Other Environmental Concerns
No
No
Yes
Yes
Delete Sites
Refer to Base Environmental Program
List of Sites to be Rated
Consolidate Specific Site Data
Apply AF Hazard Rating Methodology
Numerical Site Rating
Conclusions
Recommendations
USAF Review of Report Recommendations
No Further Action
Refer to Medical Service for Phase II Action

CHAPTER 2

INSTALLATION DESCRIPTION

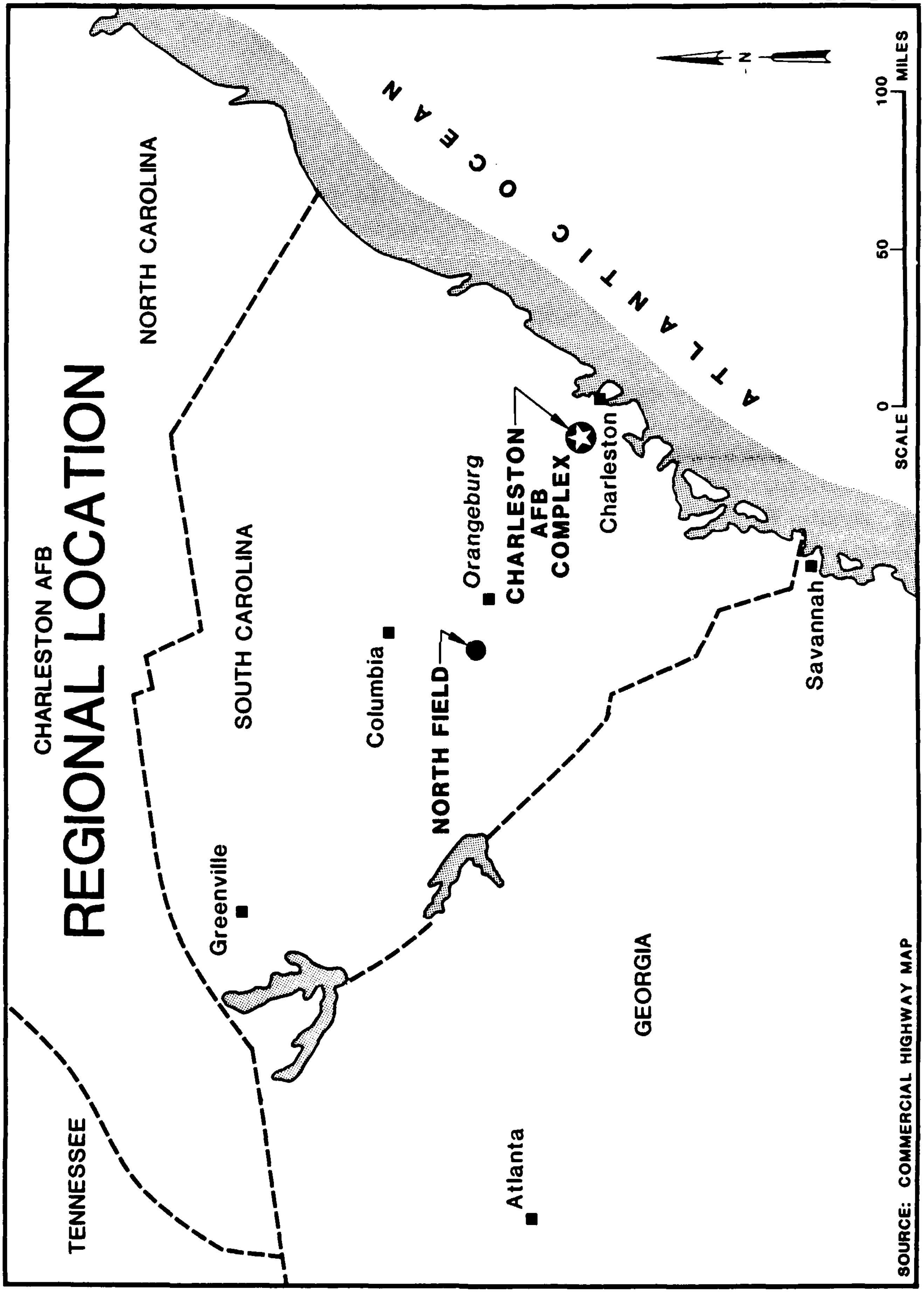
LOCATION AND SIZE

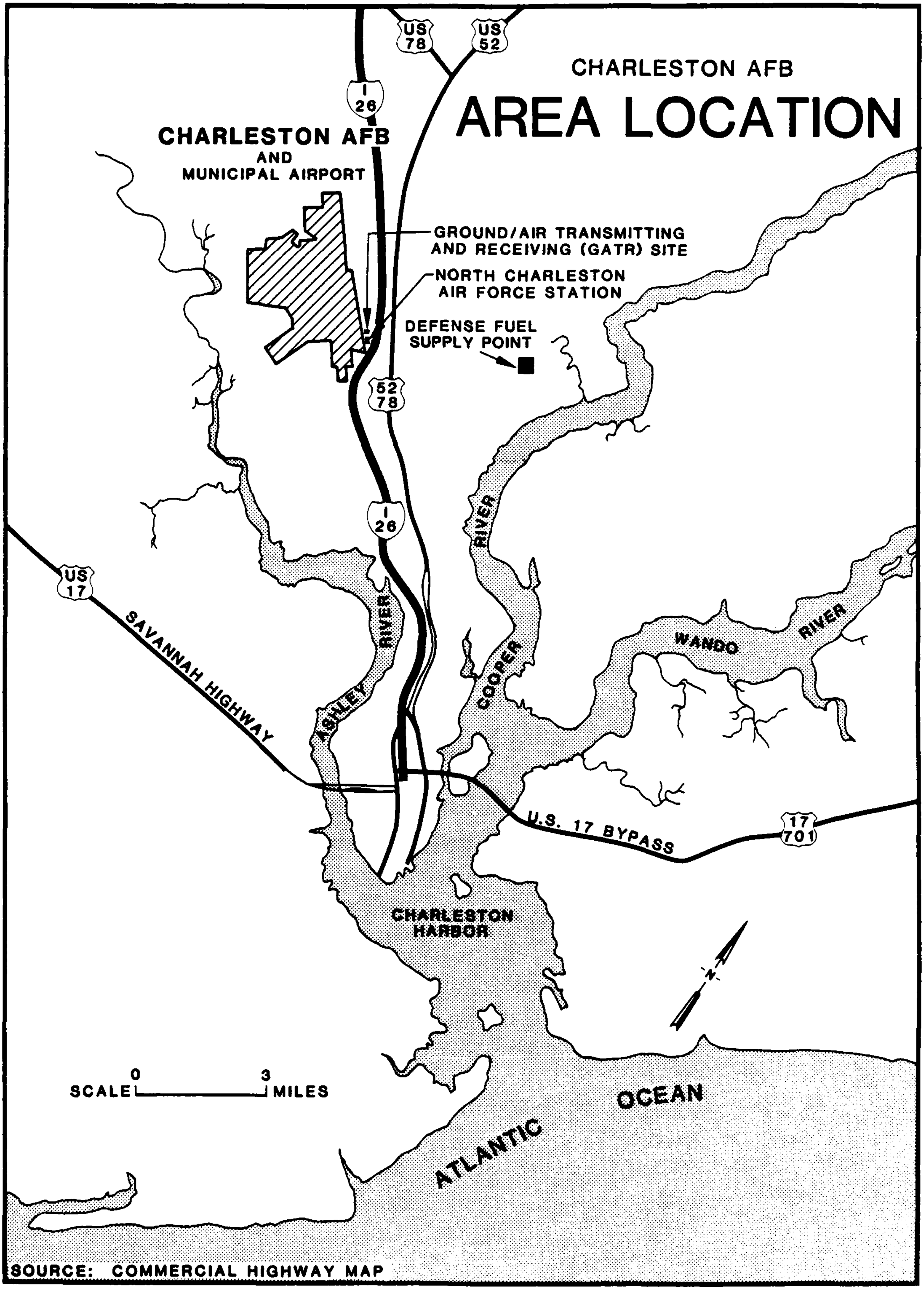
Charleston Air Force Base is located in Charleston County, approximately sixteen miles northwest of Charleston, South Carolina. The base is comprised of 3,731 acres of contiguous property, with a base population of approximately 8,500. In addition to Charleston AFB, four off-base sites are included in the study. North Auxiliary Air Field (North Field), a 2,391-acre air base used for aerial delivery training, is located approximately 85 miles northwest of Charleston AFB. The Ground/Air Transmitter-Receiver (GATR) Site, a five-acre communications facility, is located adjacent to the eastern boundary of Charleston AFB. The North Charleston Air Station Site, a 24-acre area used for housing, is located adjacent to the eastern boundary of Charleston AFB. The Charleston Defense Fuel Supply Point (DFSP), a 56-acre fuel off-loading facility, is located east of Charleston AFB approximately 1.5 miles west of the Cooper River. The DFSP is owned by the Air Force and operated by Defense Logistics Agency. Figure 2.1 shows the regional location of Charleston AFB and North Auxiliary Air Field. Figure 2.2 shows the location of Charleston AFB, the Ground/Air Transmitter-Receiver Site, the North Charleston Air Station Site, and the Defense Fuel Support Point in the Charleston area.

BASE HISTORY

Charleston Air Force Base, activated as an Army Air Base four days after the Japanese attack on Pearl Harbor, was established adjacent to the Charleston Municipal Airport to utilize the airport's existing facilities. The base was initially established for defense and training of bomber forces during World War II. After World War II ended, the base closed and the property was returned to the City of Charleston.

FIGURE 2.1


CHARLESTON AFB
REGIONAL LOCATION
NORTH CAROLINA
SOUTH CAROLINA
GEORGIA
TENNESSEE
ATLANTIC OCEAN
Greenville
Columbia
Orangeburg
Charleston
Savannah
Atlanta
NORTH FIELD
CHARLESTON AFB COMPLEX
N
SCALE
0
50
100 MILES
SOURCE: COMMERCIAL HIGHWAY MAP


CHARLESTON AFB
AREA LOCATION
US 78
US 52
I 26
CHARLESTON AFB
AND
MUNICIPAL AIRPORT
GROUND/AIR TRANSMITTING
AND RECEIVING (GATR) SITE
NORTH CHARLESTON
AIR FORCE STATION
DEFENSE FUEL
SUPPLY POINT
52
78
I 26
US 17
SAVANNAH HIGHWAY
ASHLEY RIVER
COOPER RIVER
WANDO RIVER
U.S. 17 BYPASS
17
701
CHARLESTON
HARBOR
N
SCALE 0 3 MILES
ATLANTIC
OCEAN
SOURCE: COMMERCIAL HIGHWAY MAP

While in possession of the property from 1946 to 1952, the city periodically leased portions of land for use by private businesses. Also during this time, in 1947 a new municipal airport facility was completed. The Korean War, and the expanded Air Transport Service, led to the reactivation of a military air base at Charleston. In 1952, the Air Force began construction of facilities west of those existing, to support a troop carrier operation. In 1966, the Military Air Transport Service (MATS) became the Military Airlift Command (MAC). Charleston AFB has remained a MAC base since that time. Figure 2.3 presents the site plan at Charleston AFB. The runways are part of Charleston Air Force Base and are used by both Charleston County Aviation Authority and the Air Force under a joint use agreement.

North Auxiliary Air Field was acquired by the War Department approximately the same time Charleston AFB was established. Originally used as a training base by the Army Air Corps during World War II, it has been used for operational training and exercises, for aerial delivery training by MAC units, by National Guard units on deployment, and by Tactical Air Command units based at Shaw AFB for base exercises. In 1979, control of North Auxiliary Air Field passed from Shaw AFB to the 437th Military Airlift Wing (MAW). Figure 2.4 presents the site plan at North Auxiliary Air Field.

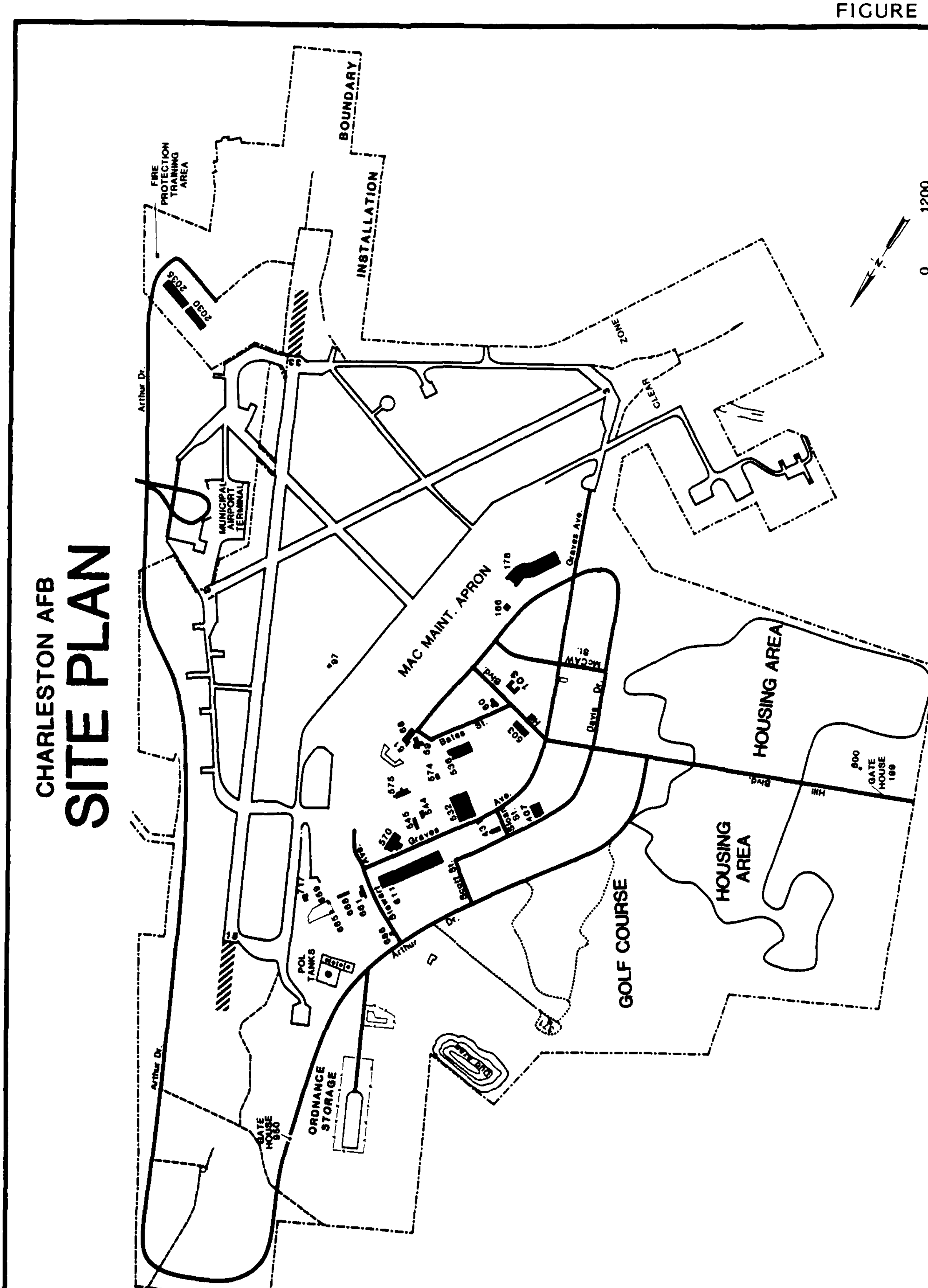
ORGANIZATIONS AND MISSIONS

The present host command at Charleston AFB is the 437th Military Airlift Wing, whose primary mission is to maintain immediate airlift capability to deliver and sustain air and combat forces to combat locations. During peacetime, operations include resupply of overseas American embassies and military installations, and supply of aid to natural disaster areas. The Wing also provides the support functions to maintain the Charleston AFB facilities.

Tenant organizations at Charleston AFB are listed below. Descriptions of the base tenant organizations and their missions are presented in Appendix C.

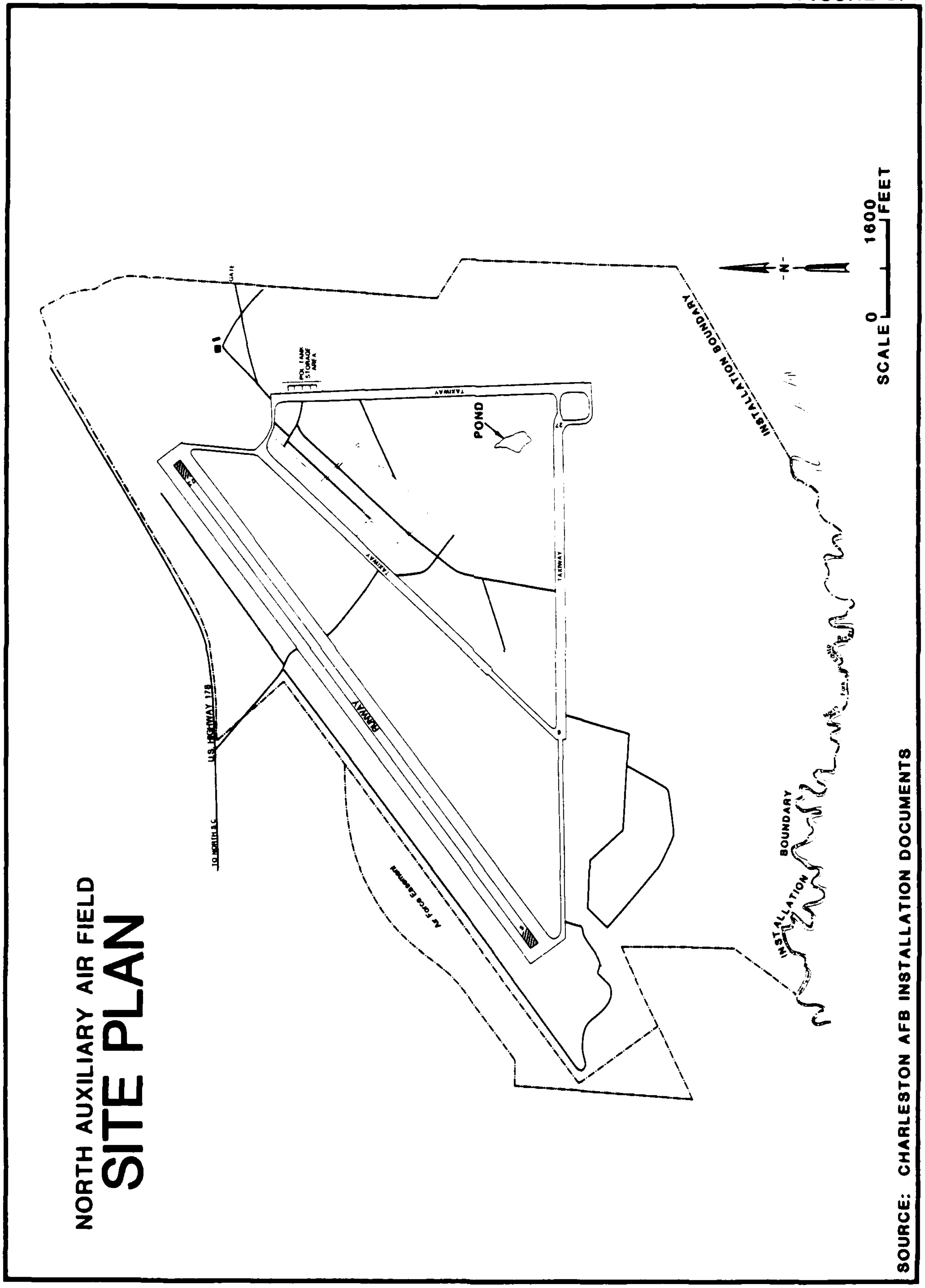
- 315th Military Airlift Wing (associate)
- 707th Military Airlift Squadron

FIGURE 2.3



SOURCE: CHARLESTON AFB INSTALLATION DOCUMENTS

FIGURE 2.4



SOURCE: CHARLESTON AFB INSTALLATION DOCUMENTS

- 701st Military Airlift Squadron
- 300th Military Airlift Squadron
- 51st Aerial Port Squadron
- 81st Aerial Port Squadron
- 31st Aeromedical Evacuation Squadron
- 1968th Communications Squadron
- Detachment 7, 1361st Audiovisual Squadron (AAVS)
- Detachment 6, 1600th Management Engineering Squadron (MACMET)
- Detachment 1, 87th Fighter Interceptor Squadron
- Detachment 3, 15th Weather Squadron
- Detachment 2103, Office of Special Investigation's (OSI)
- Field Training Detachment 317 (ATC)
- Area Defense Counsel
- Air Force Audit Agency (AFAA) Area Audit Office
- Armed Forces Courier Station
- Military Air Traffic Coordination Unit
- Army Assistance Office
- Air Force Commissary Services (AFCOMS)

CHAPTER 3

ENVIRONMENTAL SETTING

The environmental settings of Charleston Air Force Base, the Charleston Defense Fuel Support Point (DFSP), the North Charleston Air Station and the Air/Ground Transmitting and Receiving Site (GATR) are described in this chapter. Due to the close proximity of these four installations, the environmental settings are similar and descriptions will be discussed concurrently. The environmental setting of North Auxiliary Air Field is in most aspects different from that of Charleston AFB and thus will be discussed independently. Also, the number of potentially hazardous waste sites at North Auxiliary Air Field is limited, therefore only a summary of the environmental setting of North Auxiliary Air Field is provided in this chapter with more detailed information provided in Appendix D.

METEOROLOGY

The climate of the Charleston AFB area is characterized by warm and humid summers and mild winters. Temperature, precipitation and snowfall data provided by Detachment 3, 15th Weather Squadron are presented in Table 3.1. The data indicate that the mean annual precipitation for the 30-year period was 51.4 inches. The estimated lake evaporation for the area is 43 inches (National Oceanic and Atmospheric Administration (NOAA), 1977

Two climatic features of interest in the movement of contaminants are the net precipitation (precipitation minus evaporation) and the one-year 24-hour rainfall event. The net precipitation is an indicator of the potential for leachate generation. The calculated net precipitation for the Charleston AFB area is plus eight (8) inches. The one-year 24-hour rainfall event is an indicator of the potential for storms to cause excessive runoff and erosion. The one-year 24-hour rainfall event for this area is estimated to be four (4) inches (NOAA, 1963).

TABLE 3.1

CLIMATIC CONDITIONS FOR CHARLESTON AFB

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
TEMPERATURE (°F)												
Mean Monthly	49	50	57	64	72	78	81	80	76	66	57	50
Relative Humidity (%)	56	50	51	47	55	58	60	63	62	55	52	56
PRECIPITATION (IN)												
Mean Monthly	3.2	3.3	4.3	2.5	4.3	6.6	7.6	6.7	4.8	2.9	2.1	3.1
Maximum Month	7.2	6.3	11.1	9.5	9.3	27.2	18.5	17.0	9.6	9.1	7.4	7.1
SNOWFALL (IN)												
Maximum Month	1	7	2	0	0	0	0	0	0	0	*	*

Source: Detachment 3, 15th Weather Squadron (MAC)
Period of Record: September 1949 - August 1979

Note: * Data not available

GEOGRAPHY

Charleston AFB and the DFSP are located in the Lower Coastal Plain Province between the Ashley and Cooper Rivers (Colquhoun, 1969). Charleston AFB lies closest to the Ashley River while the DFSP lies closest to the Cooper River. Charleston AFB is bordered to the south by an abandoned phosphate strip mining area and to the west by a sand and gravel quarry (Figure 3.1).

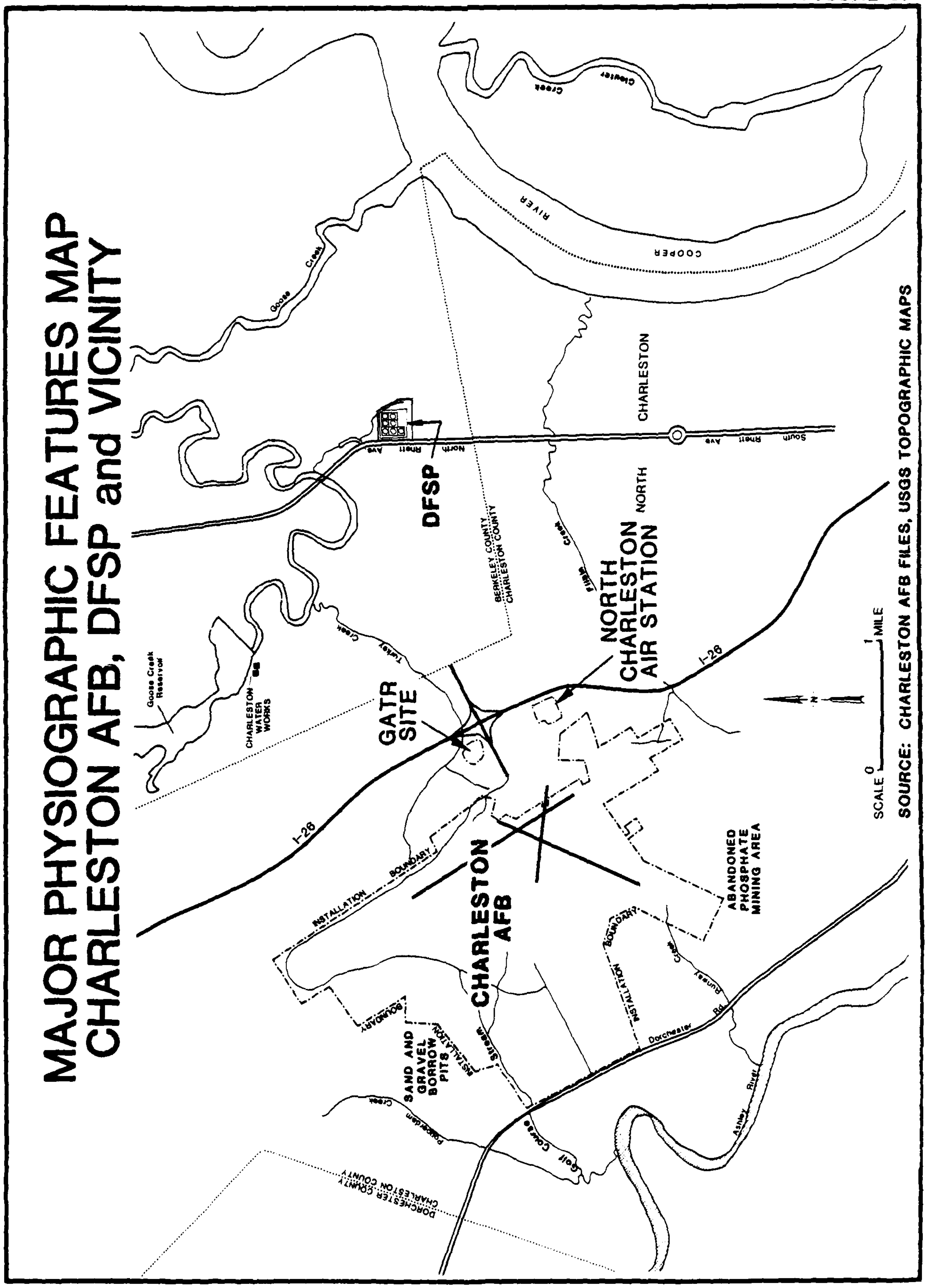
Topography

The topography of Charleston AFB and the DFSP areas is a result of continental processes such as stream erosion and delta development as well as marine processes such as scouring and sand bar and island development. Sea-level changes acting concurrently with the above continental and marine processes are also dominant landforming processes. (Colquhoun, 1969). Elevations on the Charleston AFB vary from a high of 45 feet above the National Geodetic Vertical Datum of 1929 (NGVD) on the northern end of the base to a low of 15 feet (NGVD) in the clear zone of Runway 15/33 in the southeastern corner of the base. Natural land surface elevations in the DFSP area vary from 30 to 35 feet NGVD. The immediate vicinity of the facility is developed for industrial and military purposes.

Soils

The Soil Conservation Service of the U.S. Department of Agriculture recently completed the soil mapping of the Charleston AFB. Fifteen soil types were identified (Stuck, 1983). Figure 3.2 shows the location of these soil types and Table 3.2 describes the soils and their engineering properties. The surface soils are typically sand and sandy loam, but at depth the clay content generally increases. Although relatively high permeability (6.0 - 20 inches per hour) exists in the surface soils, relatively low permeability (.06 - 6.0 inches per hour) exists from depths of eight to 80 inches below the surface. The increase in clay content and decrease in permeability at depth causes rapid saturation of the sandy surface soils following rains. Evidences of this saturation were ponded water and possible springs observed during the site visit (June, 1983).

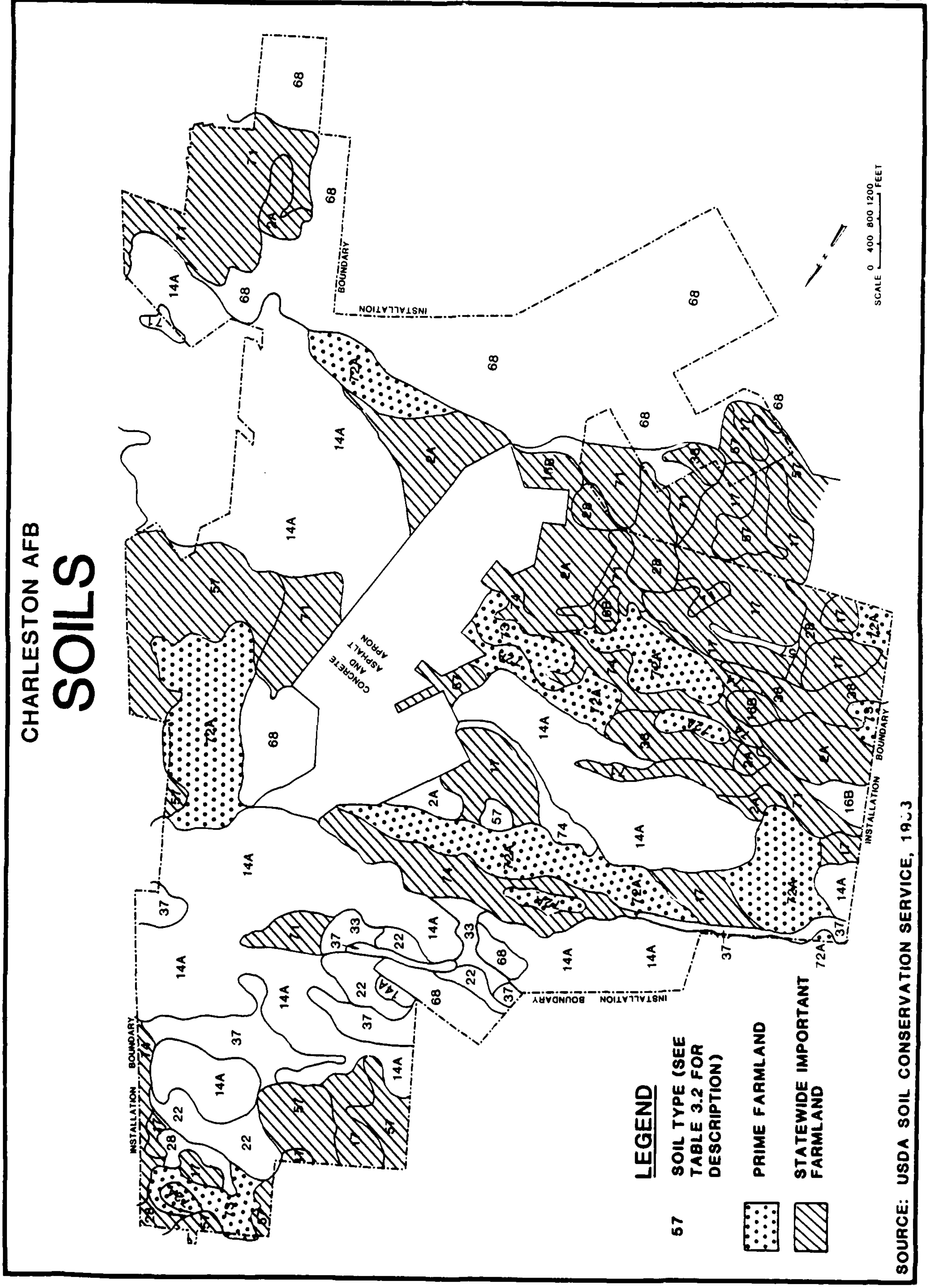
FIGURE 3.1



MAJOR PHYSIOGRAPHIC FEATURES MAP
CHARLESTON AFB, DFSP and VICINITY

SOURCE: CHARLESTON AFB FILES, USGS TOPOGRAPHIC MAPS

FIGURE 3.2



SOURCE: USDA SOIL CONSERVATION SERVICE, 19_3

TABLE 3.2
CHARLESTON AIR FORCE BASE SOILS

Symbol on Figure 3.2	Unit Description	Surface Soil Depth (inches)	Surface Soil Permeability[4] (inches/hour)	Selected Lower Soil Depths Depth (inches)	Selected Lower Soil Depths Permeability[4] (inches/hour)	Landfill Use Limitations
[1]2A	Albany fine sand	0-48	6.0-20	56-88	0.6-2.0	Severe-seepage, wetness
14A	Chipley fine sand	0-10	>6.3	10-50	>6.3	Severe-seepage, wetness
[1]16B	Chisolm fine sand	0-25	6.0-20	25-57	0.6-2.0	Severe-seepage
[1]17	Coosaw fine sand	0-32	6.0-20	35-72	0.6-2.0	Severe-seepage, wetness
22	Echaw fine sand	0-5	2.0-20	5-40	6.0-20	Severe-seepage, wetness
[1]28	Hobcaw fine sandy loam	0-18	2.0-6.0	18-46	0.6-2.0	Severe-seepage, wetness
33	Leon fine sand	0-12	6.0-20	12-80	0.6-6.0	Severe-seepage, wetness
37	Lynn Haven loamy fine sand	0-16	6.0-20	16-30	0.6-6.0	Severe-seepage, wetness
[1]38	Meggett fine sandy loam	0-8	2.0-6.0	8-52	0.06-0.2	Severe-wetness
[1]57	Ogeechee fine sandy loam	0-8	0.6-2.0	8-60	0.6-2.0	Severe-wetness
68	[3]Udorthents, sandy and loamy	-	-	-	-	-
[1]71	Williman loamy fine sand	0-26	2.0-6.0	26-80	0.6-2.0	Severe-seepage, wetness
[2]72A	Yauhannah loamy fine sand	0-9	6.0-20	9-52	0.6-2.0	Severe-wetness
[2]73	Yemassee loamy fine sand (Prime Farmland when sufficiently drained)	0-12	6.0-20	12-75	0.6-2.0	Severe-seepage, wetness
[1]74	Yonges fine sandy loam	0-14	0.6-2.0	14-42	0.2-0.6	Severe-wetness

Notes: 1 - Statewide Important Farmland (see Appendix K for definition)
2 - Prime Farmland (see Appendix K for definition)
3 - Soil unit in which properties vary due to removal of top soil and some subsoil (fill)
4 - To convert inches/hour to centimeters/second, multiply values shown by 0.0007

Source: USDA, SCS, 1983

SURFACE-WATER RESOURCES

Charleston AFB and the DFSP are located approximately 12 miles northwest of the Ashley and Cooper River confluence in Charleston Harbor. Neither site is located in a floodplain area. The closest 100-year flood plain boundary to the Charleston AFB is approximately 1,200 feet off base downstream of Golf Course Stream, tributary of Popperdam Creek (Figure 3.3). The closest 100-year flood plain boundary to the DFSP is approximately 2,000 feet off base downstream of the unnamed tributary east of North Rhett Avenue (Figure 3.4) (Federal Emergency Management Agency FEMA), 1976 and FEMA, 1977). Flood plain zone designations in Charleston County are presently being revised by the Corps of Engineers (Campbell, 1983).

Drainage

Surface drainage on the Charleston AFB occurs in nine streams which exit the base and two ponds with internal drainage (Figure 3.3). Drainage from approximately 3,500 acres of water shed area is controlled by open and concrete-lined ditches as well as buried reinforced concrete pipes. The three major drainage streams that are permitted by the National Pollutant Discharge Elimination System (NPDES) are: (1) Golf Course Stream which empties into Popperdam Creek, a tributary of the Ashley River, (2) Runway Creek near Runway 03/21 which also empties into the Ashley River and (3) Turkey Creek near Runway 15/33. Turkey Creek empties into Goose Creek and Goose Creek empties into the Cooper River near the U.S. Naval Reservation. The drainage divide on the base is located approximately parallel to Runway 15/33. Two small ponds receive limited drainage from the base. These ponds are located northwest of the base trailer park in the explosives disposal area. Just off base near these two ponds, two large sand and gravel borrow pits receive some drainage from the base.

Surface drainage in the DFSP area which is totally in the Cooper River watershed is controlled by an internal dike drainage system which passes through an oil/water separator on the east side of the facility. Waste water is discharged into a ditch which flows northeast toward a small reservoir. The reservoir discharges into Goose Creek (Figure 3.4).

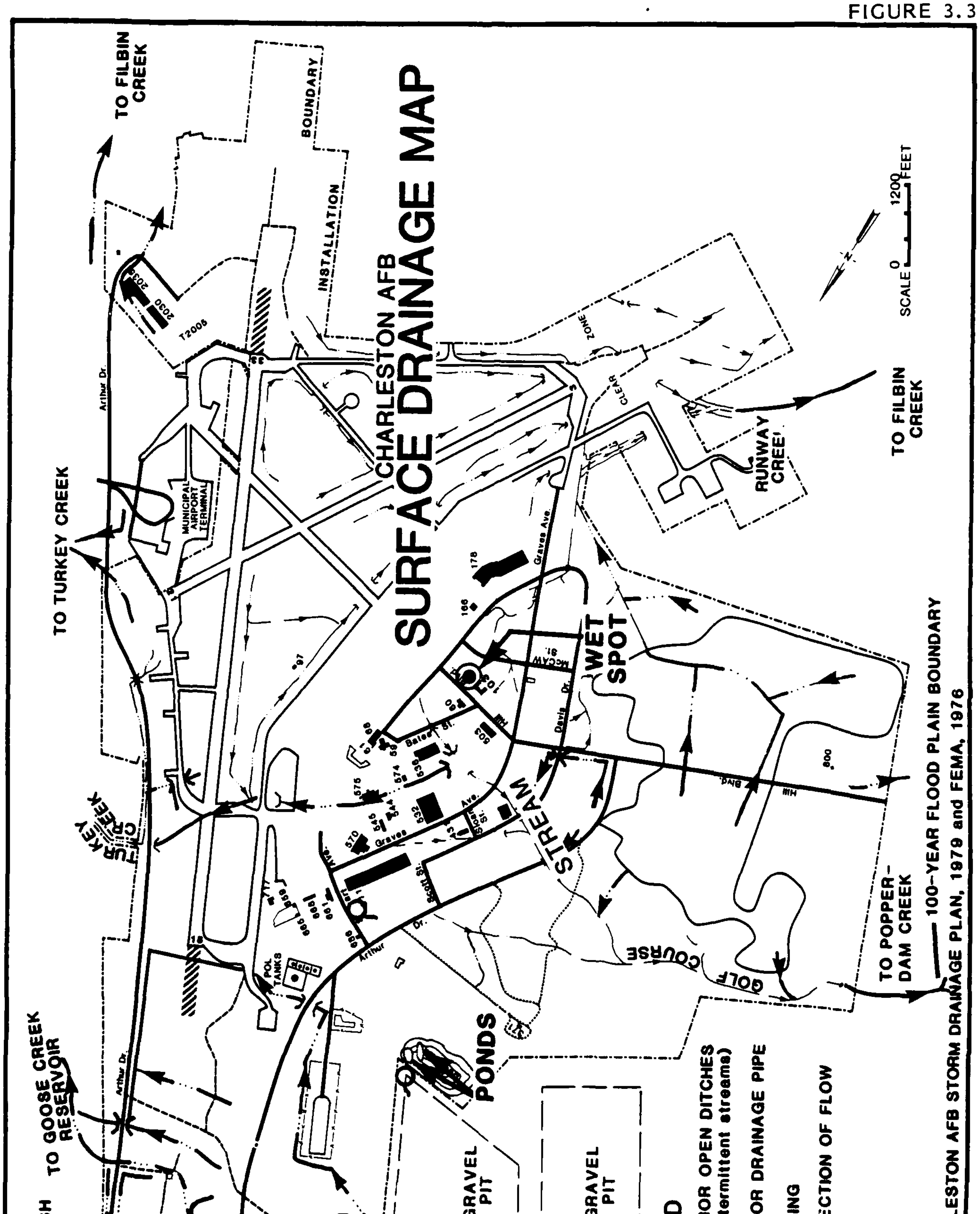
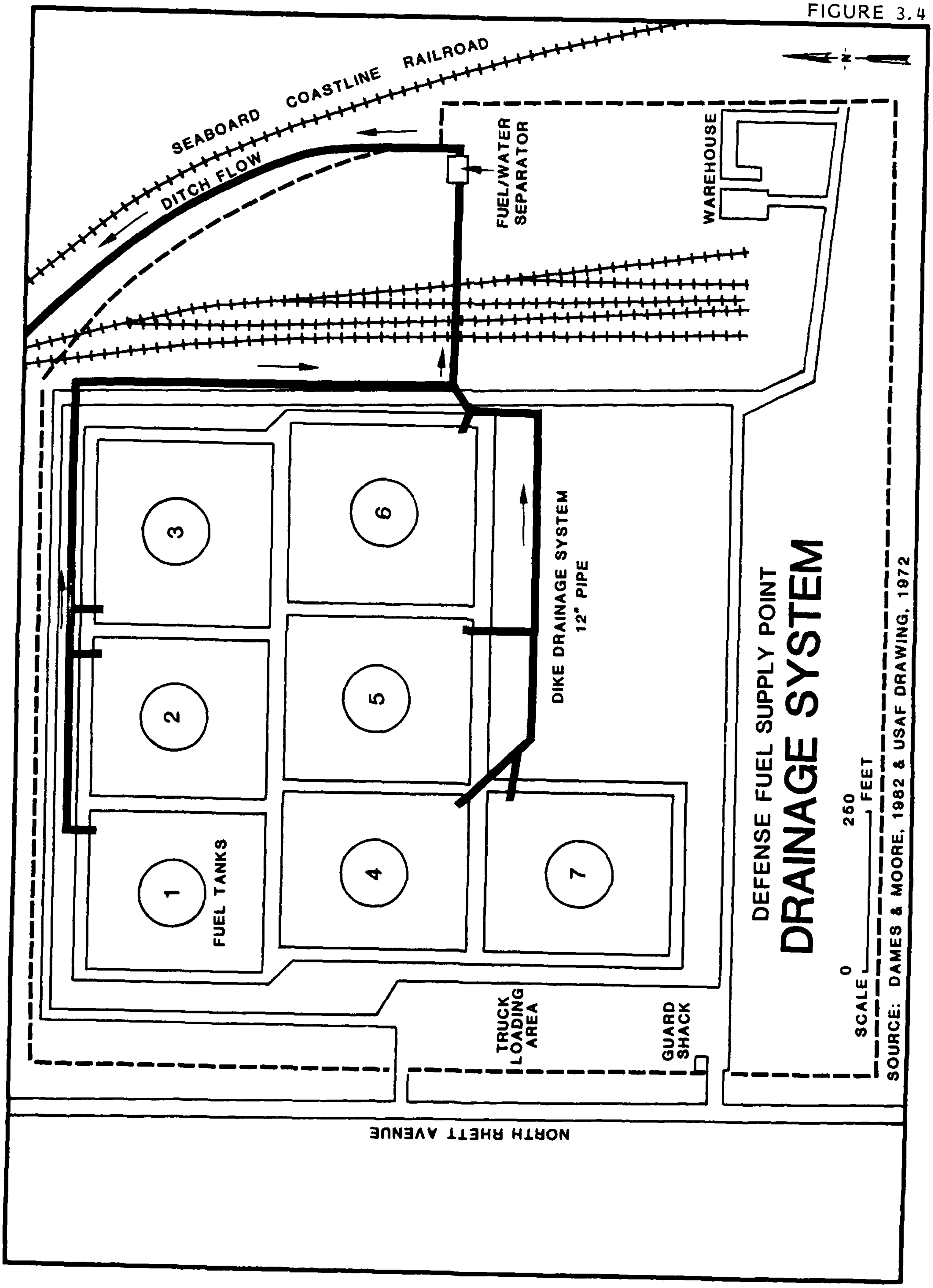

CHARLESTON AFB
SURFACE DRAINAGE MAP
INSTALLATION BOUNDARY
TO FILBIN CREEK
TO FILBIN CREEK
TO TURKEY CREEK
TURKEY CREEK
TO GOOSE CREEK RESERVOIR
TO MARSH AREA
TO POPPERDAM CREEK
TO POPPER-DAM CREEK
SAND AND GRAVEL BORROW PIT
SAND AND GRAVEL BORROW PIT
PONDS
WET SPOT
STREAM
GOLF COURSE
RUNWAY CREEK
CLEAR ZONE
MUNICIPAL AIRPORT TERMINAL
POL TANKS
Arthur Dr.
Graves Ave.
Davis Dr.
McCAW St.
Bates St.
Scott St.
Hill Blvd.
SCALE 0 1200 FEET
N
LEGEND
MAJOR OPEN DITCHES (intermittent streams)
MAJOR DRAINAGE PIPE
SPRING
DIRECTION OF FLOW
100-YEAR FLOOD PLAIN BOUNDARY
SOURCE: CHARLESTON AFB STORM DRAINAGE PLAN, 1979 and FEMA, 1976

FIGURE 3.4



SEABOARD COASTLINE RAILROAD
DITCH FLOW
FUEL/WATER SEPARATOR
WAREHOUSE
N
3
6
2
5
1
4
7
FUEL TANKS
DIKE DRAINAGE SYSTEM
12" PIPE
TRUCK LOADING AREA
GUARD SHACK
NORTH RHETT AVENUE
DEFENSE FUEL SUPPLY POINT
DRAINAGE SYSTEM
SCALE
0
250
FEET
SOURCE: DAMES & MOORE, 1982 & USAF DRAWING, 1972

Surface-Water Quality

Surface-water quality in the Charleston AFB and DFSP vicinity are generally described as good (Ashley-Combahee-Edisto River Basin Framework Study) ("ACE"), 1972 and Cooper River, 1979. The Ashley River in the vicinity of the base is classified as a Class B stream, whereas the Cooper River in the vicinity of the base is classified as a Class SC stream. Quality in Class B streams is to be maintained suitable for secondary contact recreation and as a resource for drinking water supply after conventional treatment. Quality in Class SC streams, tidal salt waters, is to be maintained suitable for secondary contact recreation, crabbing, and fishing. The quality is not suitable for the harvesting of clams, mussels or oysters for human consumption (SC Water Classification Standards System, 1981).

A major impact on the water quality in the Ashley and Cooper Rivers is the salt-water encroachment upstream. Saline water with a specific conductance of 125 micromhos at 25°C has been documented as far north as 35.5 miles upstream from the mouth of the river (Cooper River, 1979). Presently Goose Creek is also considered to be saline during high tides below the Goose Creek Reservoir. The Ashley River is considered to be saline at high tides at Highway 165 in Dorchester County approximately 25 miles from the mouth of the river (Knowles, 1983). All streams discharge from Charleston AFB into larger streams within the salt-water encroachment limits.

Water quality data from vicinity and NPDES sampling stations are tabulated in Table 3.3 and station locations are identified in Figure 3.5.

Surface-Water Use

Surface water in the vicinity of Charleston AFB and the DFSP is used for recreation and water supply. The Charleston Commission of Public Works maintains an area-wide central water supply system from which Charleston AFB and the DFSP obtain drinking water. The water supply intakes are on the Edisto River, approximately 25 miles northwest of Charleston AFB, on Goose Creek Reservoir, approximately 2.5 miles northeast of the base, and on Foster Creek, approximately eight miles north of the base. The water is transmitted from the Edisto River and Foster Creek through unlined tunnels excavated within the Cooper

TABLE 3.3

SURFACE-WATER QUALITY DATA FOR CHARLESTON AFB AND VICINITY

Station Identification (Major Streams)	Date	Selected Parameters										
		pH (field)	Specific Conductance (field) (umhos/cm)	Chloride (mg/l)	Total Iron (ug/l)	Total Chromium (ug/l)	Total Lead (ug/l)	Cyanide (mg/l)	Phenols (ug/l)	Total Organic Carbon (mg/l)	Oil & Grease (mg/l)	Lindane (ug/l)
MD-044 Cooper River at Goose Creek	01/25/83	7.55	3100	NA	310	<50	70	NA	NA	4.4	NA	NA
MD-049, Ashley River at Magnolia Gardens	01/06/83	7.80	120	NA	1000	<50	<50	NA	NA	19.3	NA	NA
MD-113, Goose Creek Reservoir at Charleston Water Intake	01/26/83	7.70	130	NA	320	<50	<50	NA	NA	9.9	NA	NA
(NPDES)												
35-NS-001, Runway Creek	10/19/82 04/29/82	7.0	NA	20	576	<50	<50	<0.01	<10	4	0.7	NA 0.13
35-NS-002, Turkey Creek Pool	11/30/82	7.0	NA	20	2240	<50	<50	<0.01	<10	5	NA	<0.01
35-NS-003, Turkey Creek	02/08/83 12/28/82	7.2	NA	20	3310	<50	<50	<0.01	<10	NA	0.5	NA <0.01
35-NS-004, Golf Course Stream	01/14/83	7.0	NA	12	2320	<50	<50	<0.01	<10	2	0.3	<0.02

Notes:

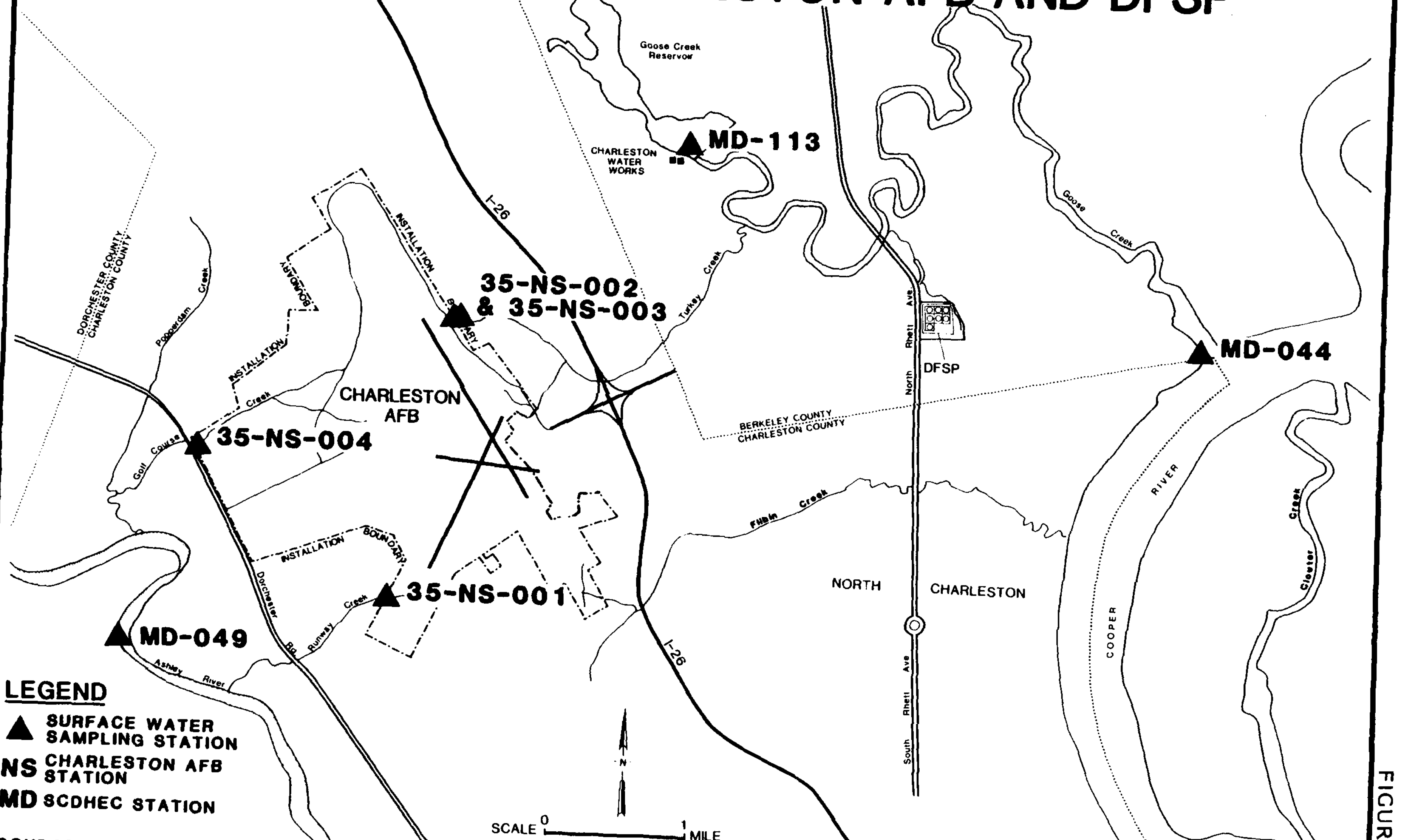
NA = Not analyzed
mg/l = milligrams per liter
ug/l = migrograms per liter
umhos/cm = micromhos per centimeter

See Figure 3.5 for station locations.

Source: SCDHEC and Charleston AFB Files

FIGURE 3.5

SURFACE-WATER QUALITY SAMPLING LOCATIONS IN VICINITY OF CHARLESTON AFB AND DFSP



SOURCE: CHARLESTON AFB FILES; SCDHEC, 1983

NOTE: SEE TABLE 3.3 FOR WATER QUALITY DATA

Formation. The average daily use of surface water within the central system is 80 million gallons per day (mgd) ("ACE", 1972). In 1975, the estimated maximum daily demand of water on the base was 1.88 mgd (TAB A-1 Files, Environmental Narrative, 1975). The average maximum daily demand of water during the first three months of 1983 was 1.85 mgd (Water Utility Operating Log, 1983).

The City of Charleston's main sewage treatment plant is located on Plum Island approximately 11 miles southeast of the base. The City of North Charleston maintained a small waste stabilization pond at the municipal airport until 1976 when it was abandoned. The effluent from the pond discharged into Turkey Creek during its operation (Koffman, 1983).

GROUND-WATER RESOURCES

The ground-water resources of the Charleston AFB and DFSP area have been reported by Stringfield and LeGrand (1966), Siple (1967), South Carolina Water Resources Commission (SCWRC) (1974), Gohn and others (1977), Park (1979), Glowaz and others (1980), Park (1982), Dames and Moore (1982) and Park (1983). Ground water is available from four major aquifer systems. The shallow aquifer is unconfined while the Tertiary limestone, Tertiary sand and Cretaceous aquifer systems are confined (Park, 1979 and SCWRC, 1974).

Hydrogeologic Units

Geologically Charleston AFB and the DFSP are located in outcrop areas of the Ten Mile Hill sand and the Ladson Formation consisting of sand, clay, shell fragments and phosphatic gravel (Malde, 1959) (Figure 3.6). Glowacz and others (1980), in their classification of shallow sediments according to land waste disposal applications criteria, refer to the outcrop area as Cainhoy Scarp consisting of sandy soils and subsoils. Figure 3.7 is Boring Log Number 4, Building No. 60, showing the typical shallow subsurface deposits on the Charleston AFB. These deposits are well exposed in an off-base sand and gravel borrow pit near the explosives disposal area. The exposure consists of dark brown to black surficial organic matter underlain by fine-to-coarse grained sand and varied colored clay. Erosional cuts are very prominent on the

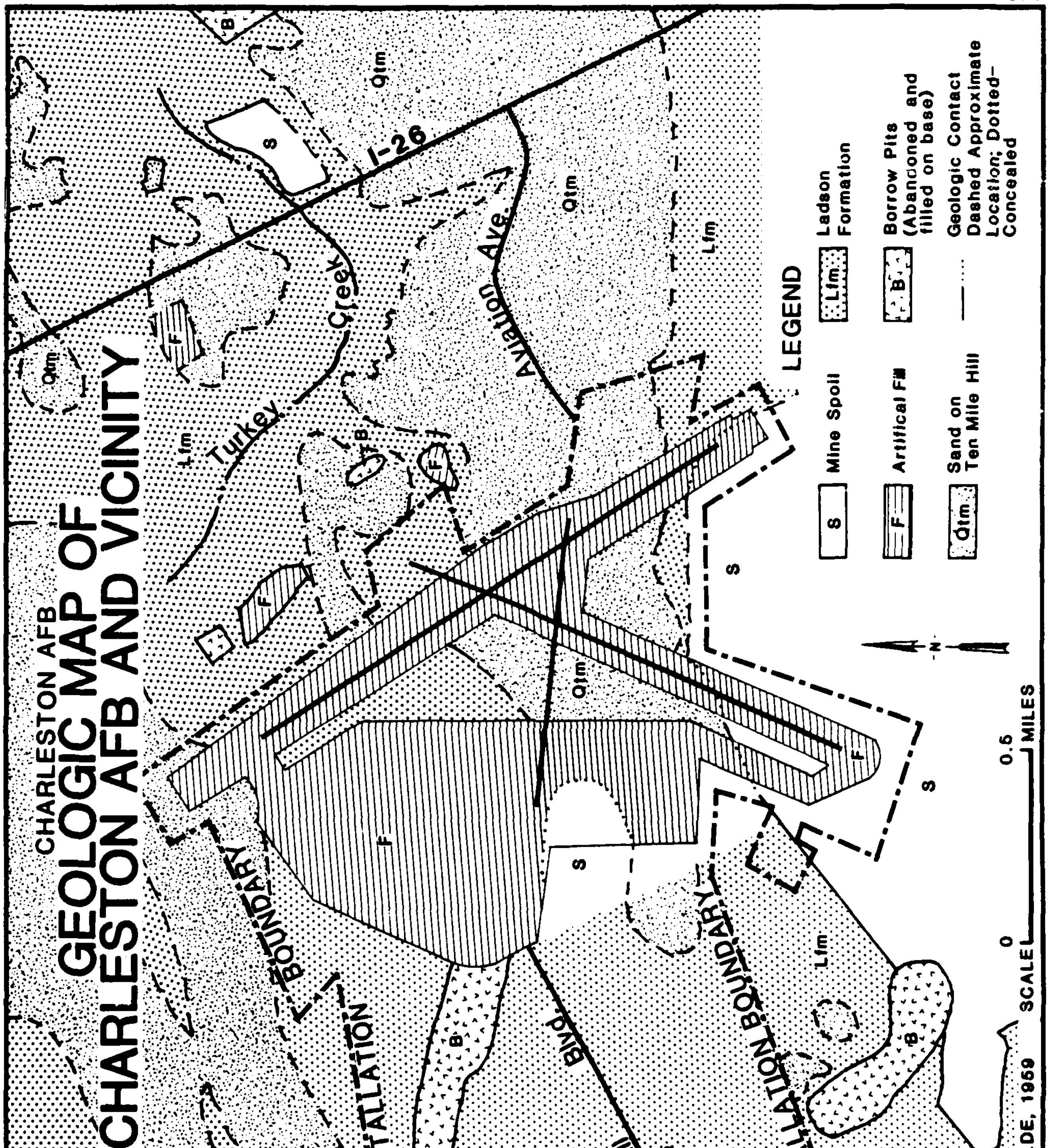
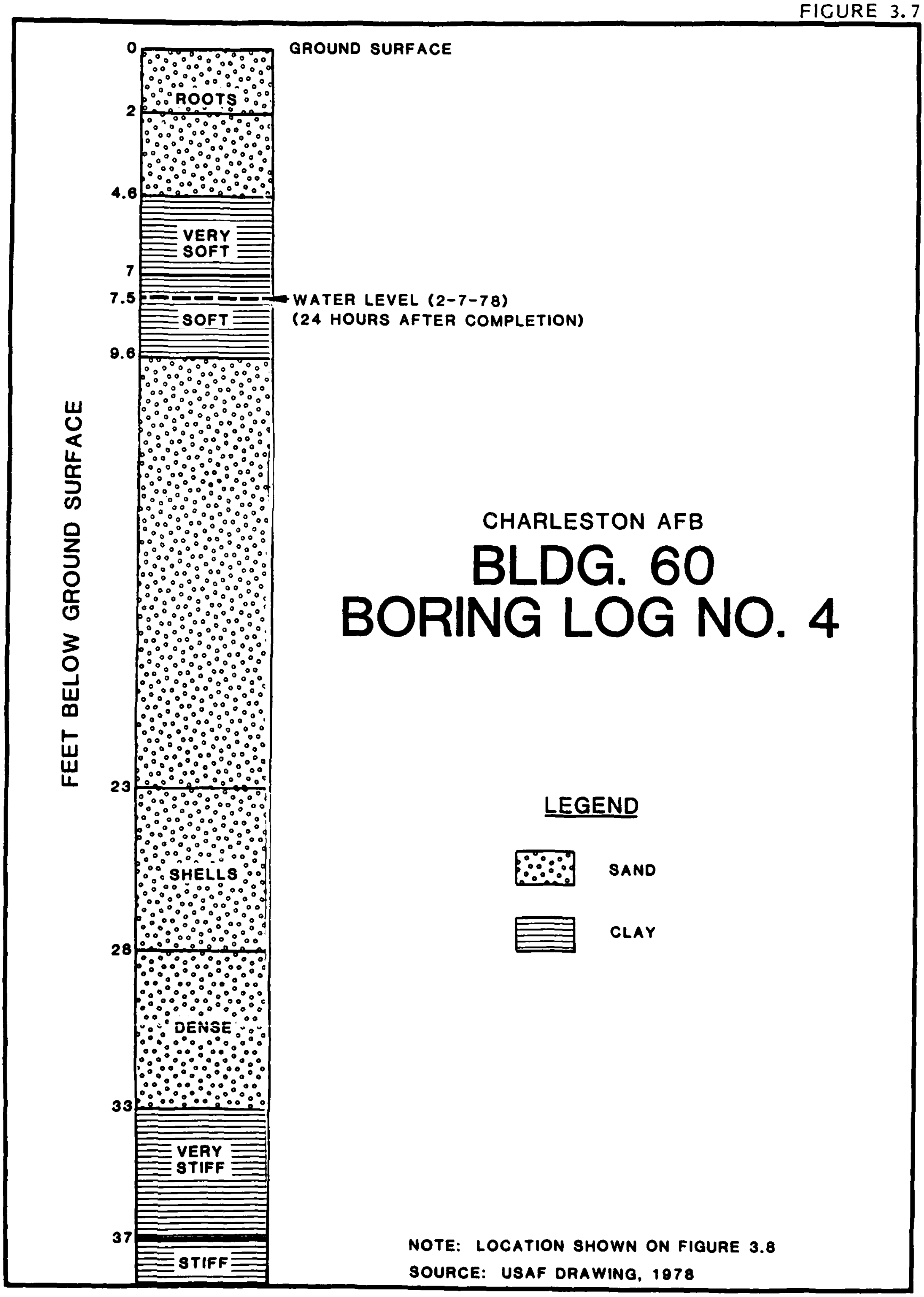

CHARLESTON AFB
GEOLOGIC MAP OF
CHARLESTON AFB AND VICINITY
LEGEND
S Mine Spoil
F Artifical Fill
Qtm Sand on Ten Mile Hill
Lfm Ladson Formation
B Borrow Pits (Abandoned and filled on base)
Geologic Contact
Dashed Approximate Location; Dotted-Concealed
N
SCALE 0 0.5 MILES
SOURCE: MODIFIED FROM MALDE, 1959
Ashley River
Dorchester Rd.
Hill Blvd
INSTALLATION BOUNDARY
INSTALLATION BOUNDARY
Turkey Creek
Aviation Ave.
I-26
Qtm
Lfm
S
F
B

FIGURE 3.7



CHARLESTON AFB
BLDG. 60
BORING LOG NO. 4

NOTE: LOCATION SHOWN ON FIGURE 3.8

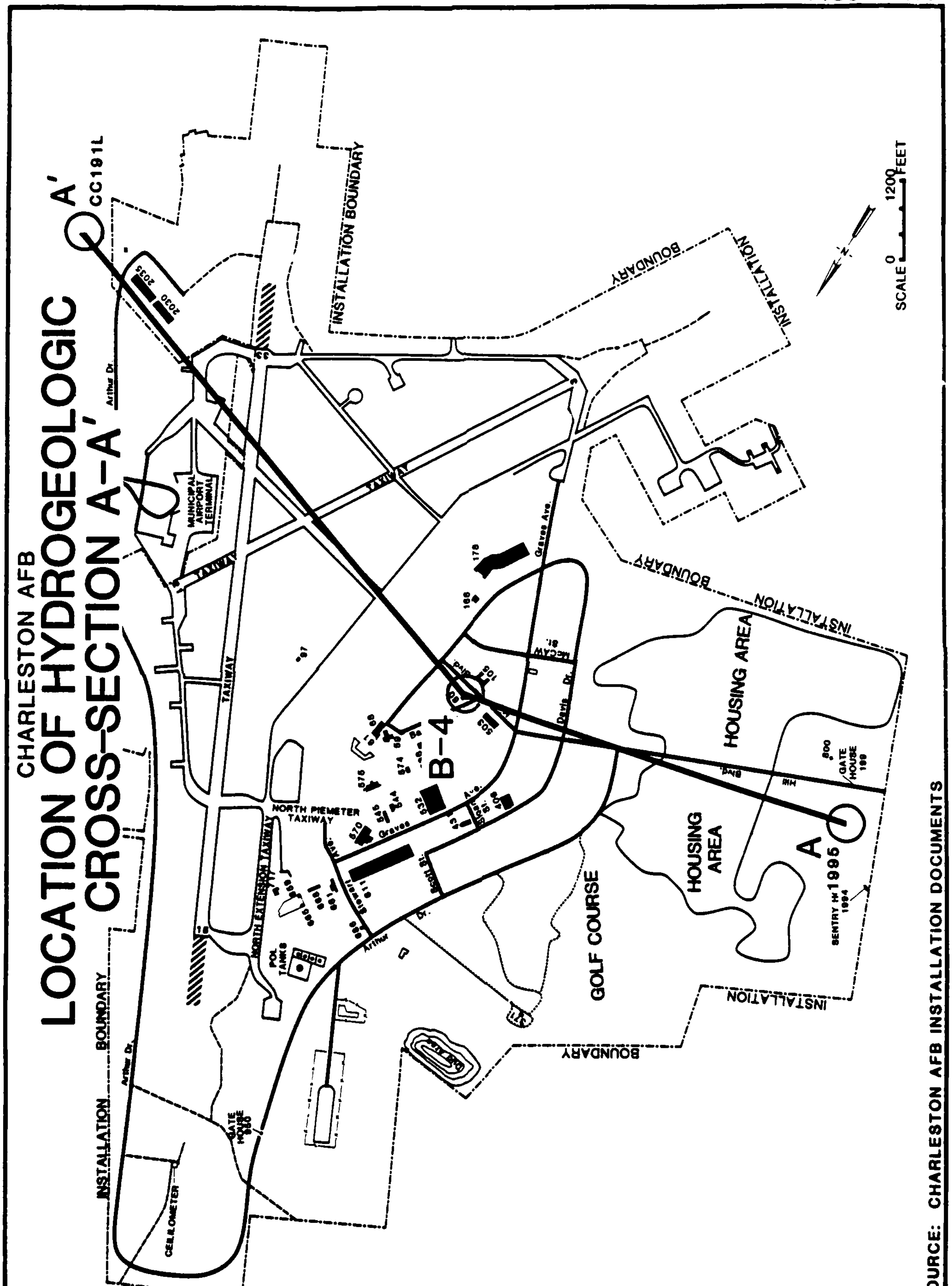
SOURCE: USAF DRAWING, 1978

slopes of the excavation. Figure 3.8 shows the location of a hydrogeologic cross section of the base. In cross-sectional view Figure 3.9 shows the vertical and horizontal distribution of sediments underlying the Charleston AFB. Figure 3.10 is Boring Log Number W-102, showing the typical shallow subsurface deposits on the DFSP site. Figure 3.11 shows the location of a hydrogeologic cross section of the DFSP site and Figure 3.12 is the cross-sectional view of the DFSP subsurface.

The Cooper Formation, composed mainly of limestone and massive olive green marl with calcite and phosphatic pebbles, underlies the shallow surficial deposits. The Cooper Formation is a thick confining layer, restricting the downward movement of ground water, but does in places yield limited amounts of ground water (Park, 1983). Phosphate mining, active in the late 1860s through early 1930s, resulted in the extensive excavation of carbonate-fluorapatite bearing pebbles from the Cooper Formation and overlying sediments (Malde, 1959). Surface mining features such as cut and fill ditches were observed during the site visit (June 1983) in the forest areas south of Runway 03/21 on Charleston AFB.

Underlying the Cooper Formation is the Santee Limestone which is a major component of the Tertiary limestone aquifer. Water yields have been reported from 200 to 500 gallons per minute (gpm) (SCWRC, 1974). The Black Mingo Formation, composed of sand, sandstone, limestone and shale underlies the Santee Limestone. The Black Mingo Formation comprises the majority of the Tertiary sand aquifer system. The Cretaceous aquifer system, composed of sand and clay, underlies the Black Mingo Formation. The Peedee, Black Creek and Middendorf (?) Formations comprise the Cretaceous aquifer system. The stratigraphic nomenclature and geologic dates of the Middendorf Formation are at present unresolved, so a question mark follows its name. Table 3.4 is a tabulation of the hydrogeologic units and their water-bearing properties.

The hydrogeologic units of interest in the Charleston area, especially the Cooper Formation and the Santee Limestone, have been affected by seismic activity in two areas. On August 31, 1886, Charleston experienced a massive earthquake which caused about 60 deaths and extensive damage (Greene and Gori, 1982). Reflection seismic surveys conducted in the Charleston area have identified an asymmetric anticline near the

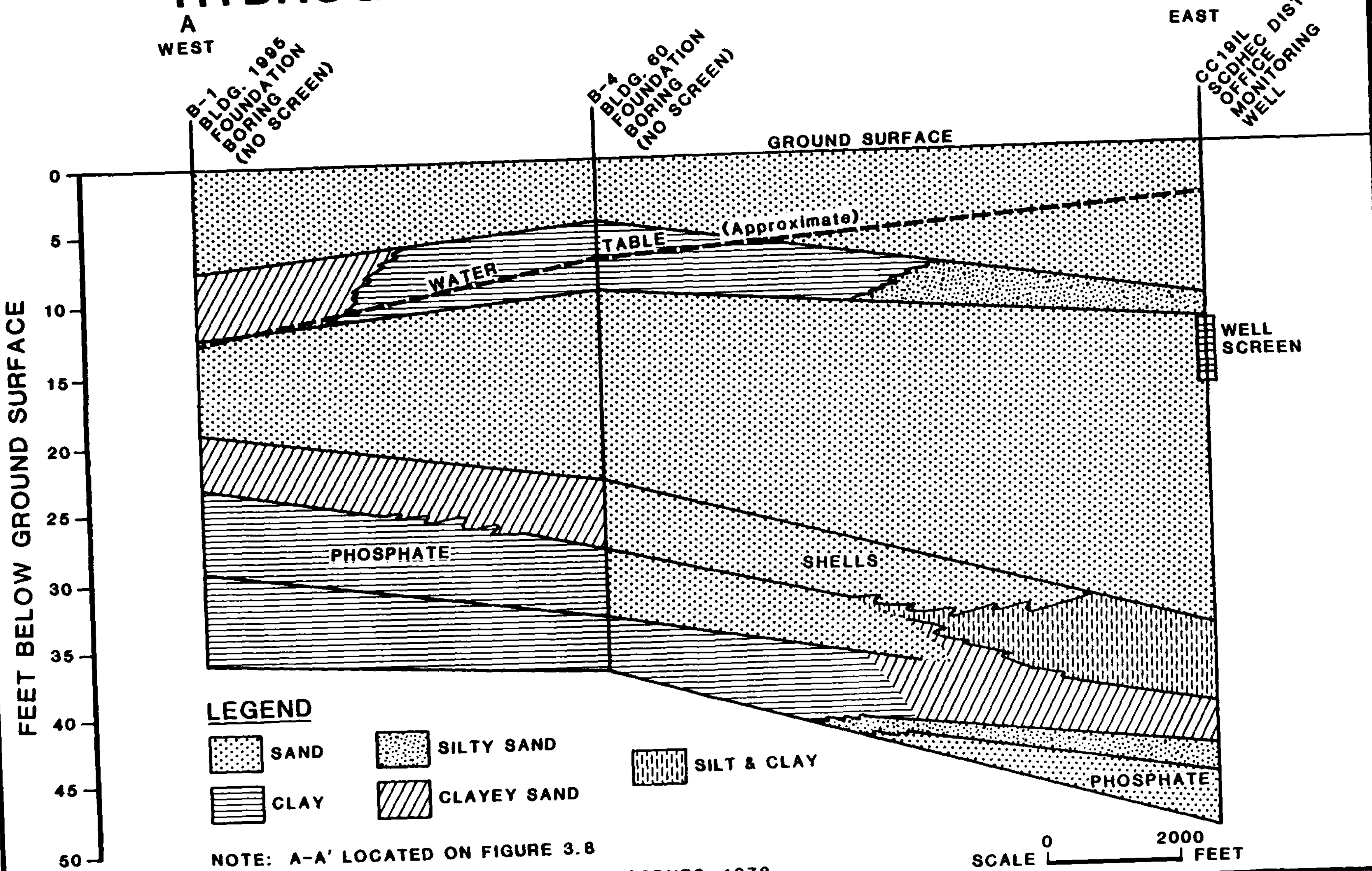


CHARLESTON AFB
LOCATION OF HYDROGEOLOGIC CROSS-SECTION A–A'

SOURCE: CHARLESTON AFB INSTALLATION DOCUMENTS

CHARLESTON AFB

HYDROGEOLOGIC CROSS-SECTION A–A′

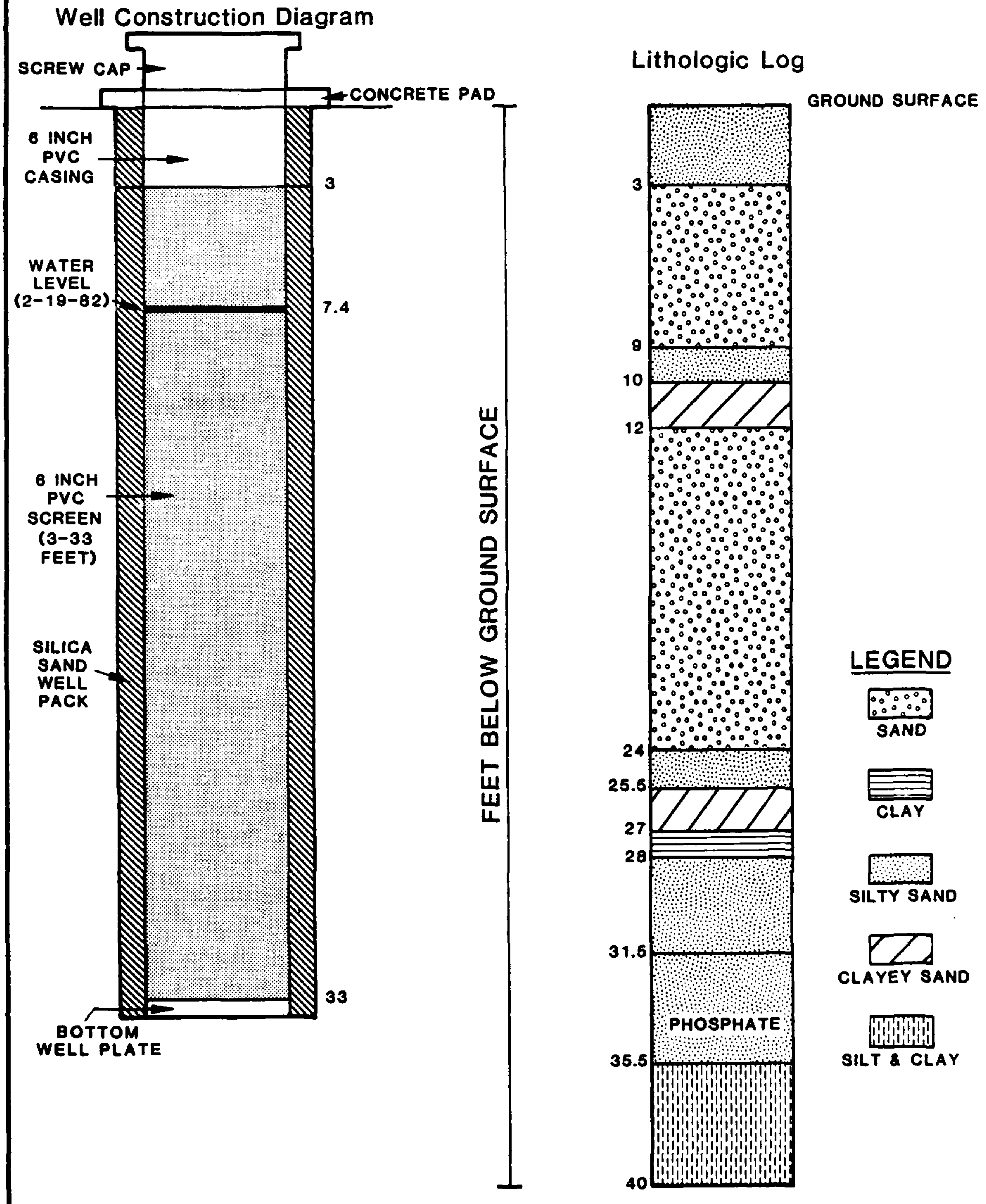


NOTE: A-A′ LOCATED ON FIGURE 3.8

SOURCE: CHARLESTON AFB DRAWINGS (1969 & 1978) AND SCDHEC, 1978

FIGURE 3.10

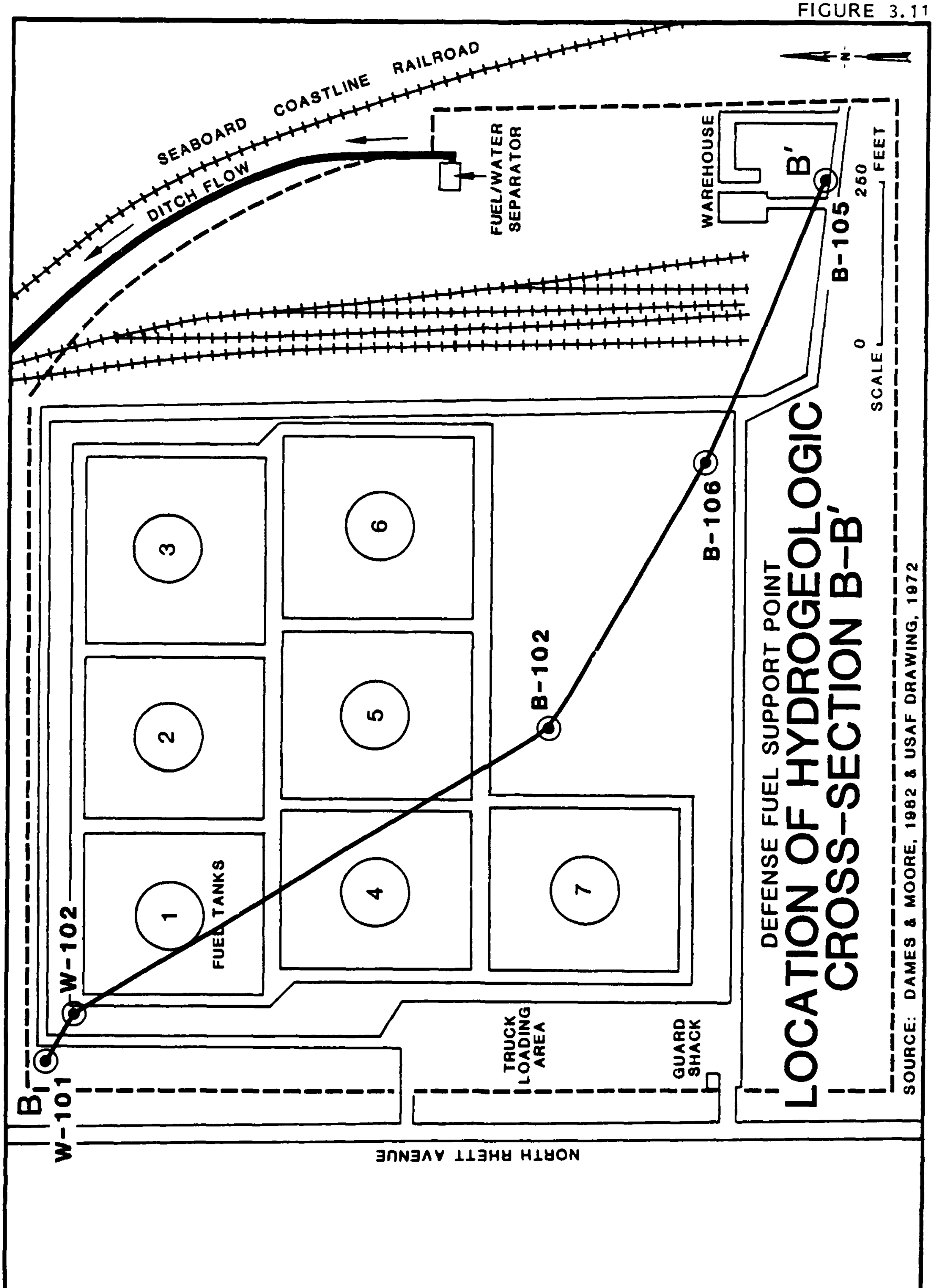
DEFENSE FUEL SUPPORT POINT
WELL LOG B-102



NOTE: LOCATION SHOWN ON FIGURE 3.11

SOURCE: DAMES & MOORE, 1982

FIGURE 3.11



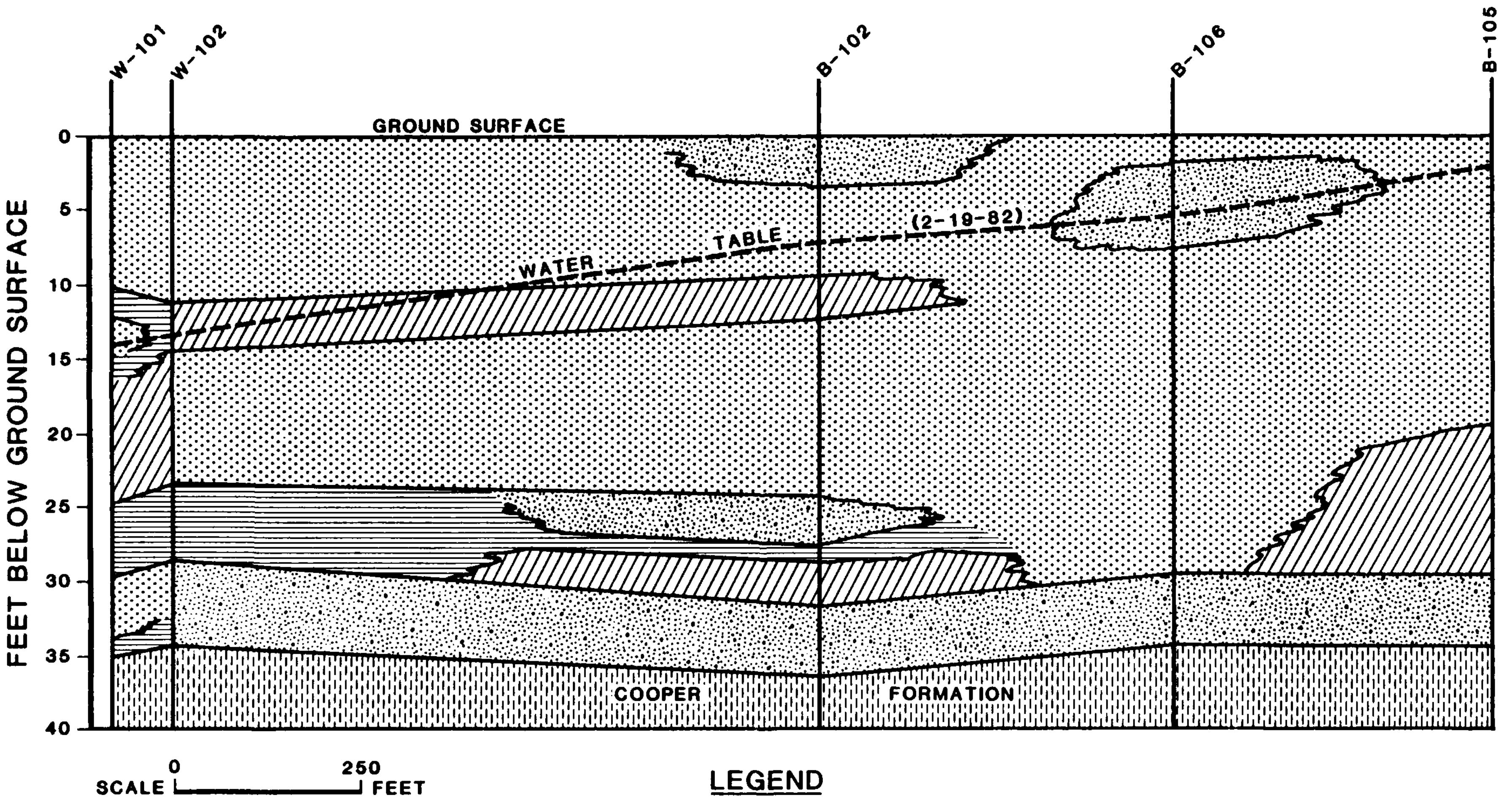
DEFENSE FUEL SUPPORT POINT
LOCATION OF HYDROGEOLOGIC CROSS-SECTION B-B'

SOURCE: DAMES & MOORE, 1982 & USAF DRAWING, 1972

FIGURE 3.12

DEFENSE FUEL SUPPORT POINT

HYDROGEOLOGIC CROSS-SECTION B-B'



NOTE: B-B' LOCATED ON FIGURE 3.11

SOURCE: DAMES & MOORE, 1982

TABLE 3.4

HYDROGEOLOGIC UNITS AND THEIR WATER-BEARING CHARACTERISTICS IN THE VICINITY OF CHARLESTON AFB

System	Series	Hydrogeologic Unit	Hydrogeologic Classification	Approximate Thickness (feet)	Dominant Lithology	Water-Bearing Characterisics
Quaternary	Pleistocene	Cainhoy Scarp[1]	Shallow aquifers (unconfined)	35	Sand and clayey sand	Readily transmits water. Transmissivity as much as 10,000 gpd/ft, less where clay content increases. Wells are screened in permeable sand zones.
	(Upper)	Sand on Ten mile Hill[2]			Sand	
	(Lower)	Ladson Formation[2]			Sand and clay with phosphatic cobbles at base	
Tertiary	Oligocene	Cooper Formation	Confining bed	200	Limestone and marl, phosphatic	Does not reailly transmit water. A major confining bed but does in places yield small amounts of water from open hole wells.
	Eocene	Santee Limestone	Tertiary limestone aquifer (confined)	180	Limestone, fossiliferous and glauconitic	Readily transmits water. Open hole wells may yield about 200 to 500 gpm. A major aquifer but locally contains objectionable amounts of chloride.
	Paleocene	Black Mingo Formation	Tertiary sand aquifer (confined)	220	Sand and sandstone or bioclastic limestone. Shales near top act as lower confining bed of Tertiary sand aquifer.	Moderately transmits water. Wells may yield from several tens of gpm to several hundred gpm. Wells in area are often completed open hole in Santee Limestone and the top portion of the Black Mingo. Also locally contains objectionable amounts of chloride.

Notes: 1 - Unit name from Glowacz and others, 1980.
2 - Unit name from Malde, 1959.
3 - Not dated

Source: Glowacz et al., 1980; Malde, 1959; Park, 1979.

gpd/ft = gallons per day per foot
gpm = gallons per minute

TABLE 3.4
(Continued)
HYDROGEOLOGIC UNITS AND THEIR WATER-BEARING CHARACTERISTICS
IN THE VICINITY OF CHARLESTON AFB

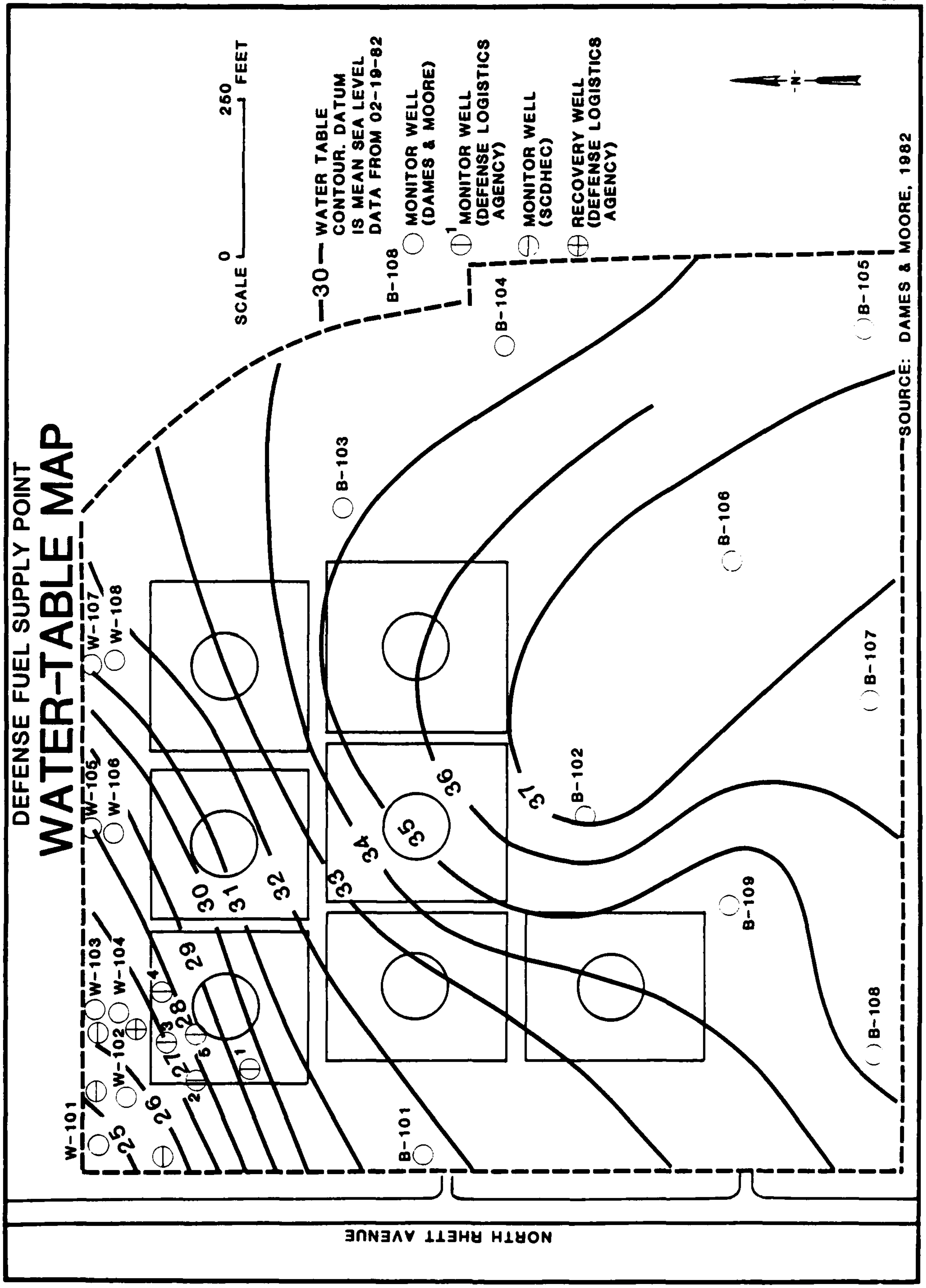
System	Series	Hydrogeologic Unit	Hydrogeologic Classification	Approximate Thickness (feet)	Dominant Lithology	Water-Bearing Characterisics
Cretaceous	Upper	Peedee Formation		540	Sand, argillacious, micaceous and glauconitic; limestone and clay.	Does not readily transmit water. Wells yield small amounts of poor quality water.
		Black Creek Formation	Cretaceous aquifer (confined)	160	Sand, phosphatic and glauconitic interbedded with clay.	Readily tran¬mits water. Wells yield from 100 to 800 gpm and flow naturally.
	Cretaceous	Middendorf (?) Formation		400	Sand and gravel interbedded with clay.	Limited data is available due to availability of water from shallower aquifers.
		Cape Fear Formation	Confining bed	200	Clay interbedded with sand	Data not available.
		Crystalline basement rock	Limited confined aquifer in fractured rock if present	Unknown	Basalt	Data not available.

Stono River west of Charleston. This anticline, which has been related to seismic activity, is referred to as the Stono Arch. The arch has associated faulting on its flanks (Colquhoun and Commer, 1973). A portion of the Stono Arch and associated faults are located in the same offshore areas southeast of Charleston where fresh-water springs have been reported (Park, 1983). The springs although not confirmed would act as discharge points for ground water within the Tertiary limestone and Tertiary sand aquifers. Another area affected by seismic activity is northwest of Charleston near Summerville, South Carolina. Numerous faults, although deep seated in basement igneous rocks, may have caused depositional changes in the Tertiary limestone aquifer resulting in thinning of the Santee Limestone southeastward toward Charleston (Behrendt, 1981). This apparent thinning may be related to the decreased hydraulic properties of the Tertiary limestone aquifer near Summerville. Due to this condition Summerville was unsuccessful in its attempts to locate sufficient ground water within the aquifer. Surface water from Charleston is now its water supply source ("ACE", 1972). Northwest of Summerville the aquifer hydraulic properties are reportedly much higher in value. A SCWRC study is now in progress within Charleston, Dorchester and Berkely Counties to completely assess the groundwater resources of the area (Park, 1983).

Hydrologically, Charleston AFB and the DFSP are located in recharge areas for the shallow aquifer. Recharge occurs as precipitation infiltrates directly into the permeable zones of the soil and migrates downward to the water-table aquifer. The water table in the Charleston AFB area is reportedly very shallow varying from two to ten feet below ground level. Water-table fluctuations vary as much as four feet (Glowacz and others, 1980). The water table on the Charleston AFB was observed on June 8, 1983, at approximately two feet below ground level in the abandoned dug well in the approach zone of Runway 15/33. Depths to the water table underlying the DFSP have varied from one to fourteen feet below ground (Dames and Moore, 1982). The maximum reported transmissivity of the shallow aquifer in Charleston County is 10,000 gallons per day per foot. The maximum reported ground-water flow rate is seven feet per day (Talts and others, 1976). Due to the confining nature of the underlying Cooper Formation, ground-water discharge from the shallow aquifer is mainly to nearby surface streams and springs. Some leakage into the Cooper Formation may occur where the formation contains permeable sand and/or limestone, or where poorly grouted or sealed wells may penetrate the Cooper Formation.

During the site visit, three springs in the shallow aquifer were observed on Charleston AFB. One, located at the sand pit adjacent to the explosives disposal area, was flowing approximately five gpm from the toe of the excavation slope (Figure 3.3). Although the spring water discharge was clear, a red precipitate and a sheen were observed downstream. Another spring was observed on the face of the drainage ditch near the Auto Hobby Shop, Building No. 638. This spring was flowing approximately one gpm clear water. point of discharge was about two feet below ground level. Since a water supply line and storm drainage pipes are nearby, it is speculated that the spring may be a result of a leaky pipe, but due to the occurrence of shallow clays in the area which may restrict the downward movement of ground water and the occurrences of pooled surface water on the base, the spring could be naturally occurring. An investigation of possible leaking pipes and shallow excavation at the spring would serve to confirm its origin. The third spring or "wet spot" as it is called, was located adjacent to Building 103. Reportedly, this spring has maintained a constant water level for many years. Speculations as to the origin of this third spring are similar to those for the second spring located near the Auto Hobby Shop. Water line inspections and a shallow excavation at the spring would serve to confirm its origin. All shallow aquifer discharge points and ground-water flow directions on the Charleston AFB have not been determined.

On the DFSP property the ground water within the shallow aquifer flows northwest toward a tributary of Goose Creek. Figure 3.13 is a potentiometric surface map of the water-table aquifer in 1982. A ground-water mound or recharge area was determined to exist under the southeastern corner of the property (Dames and Moore, 1982). Springs have also been reported to exist northwest of the DFSP (Linton, 1979). In 1975 an investigation by the U.S. Army Environmental Hygiene Agency of a petroleum fuel leak the ground-water and fuel-flow rates were


DEFENSE FUEL SUPPLY POINT
WATER-TABLE MAP
SCALE
0
250
FEET
30 WATER TABLE CONTOUR. DATUM IS MEAN SEA LEVEL DATA FROM 02-19-82
B-108 MONITOR WELL (DAMES & MOORE)
1 MONITOR WELL (DEFENSE LOGISTICS AGENCY)
MONITOR WELL (SCDHEC)
RECOVERY WELL (DEFENSE LOGISTICS AGENCY)
N
SOURCE: DAMES & MOORE, 1982
W-101
W-102
W-103
W-104
W-105
W-106
W-107
W-108
B-101
B-102
B-103
B-104
B-105
B-106
B-107
B-108
B-109
25
26
27
28
29
30
31
32
33
34
35
36
37
NORTH RHETT AVENUE

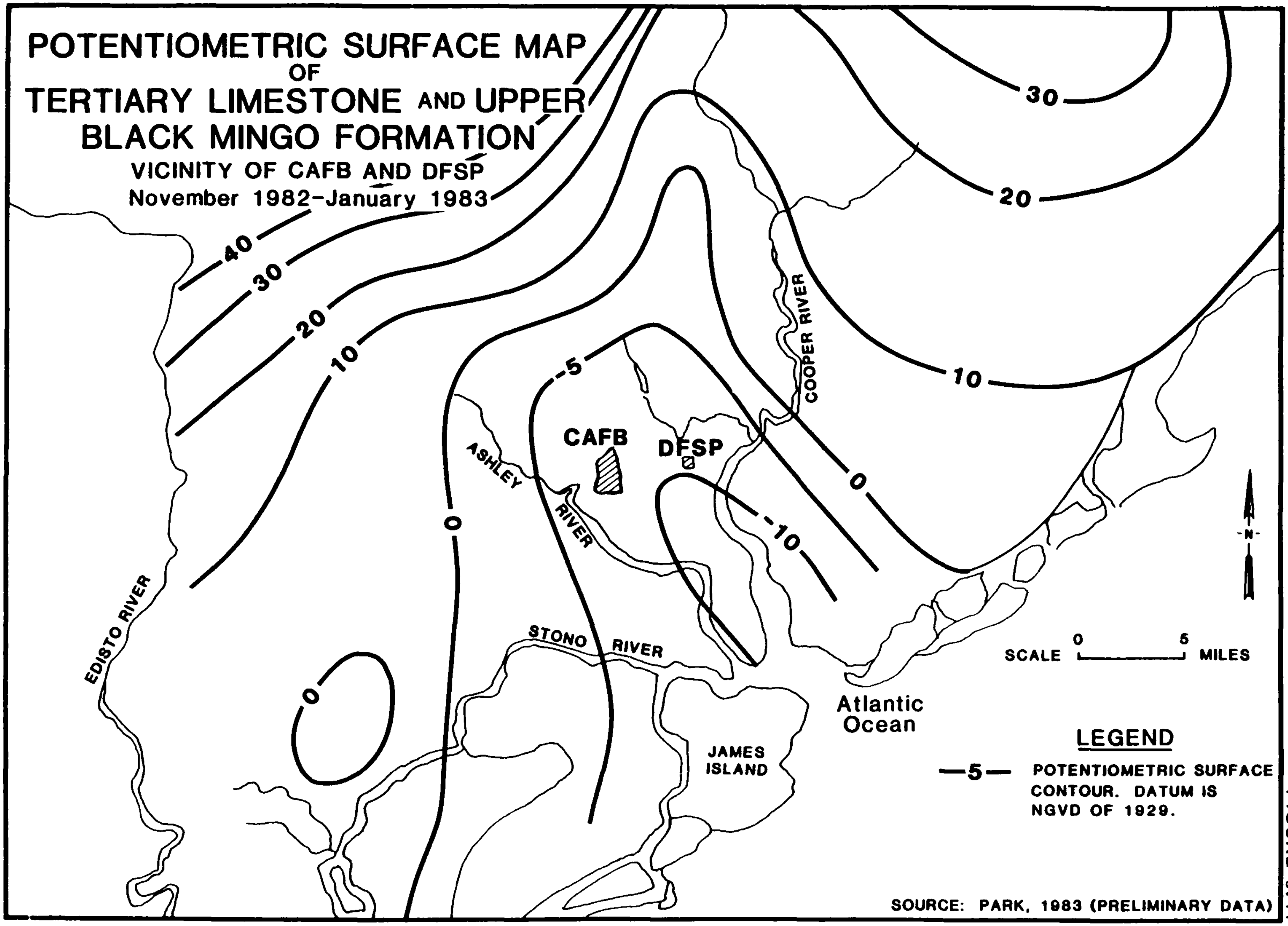
determined to be between two and seven feet per day. A laboratory permeability test of sands underlying the site yielded results of 0.01 to 0.001 centimeters per second, indicating very permeable zones (Talts and others, 1976).

The Tertiary limestone aquifer is the uppermost major confined aquifer in the area. Wells tapping this aquifer may yield 200 to 500 gpm and range in depth from 300 to 550 feet in depth (SCWRC, 1974 and Park, 1983). Water levels in 1963 were as low as 150 feet below MSL, causing salt-water encroachment (SCWRC, 1974). Since 1974, a trend of rising water levels has occurred in the industrial area of Charleston near the Cooper River. Water levels have risen from a low of 90 feet below land surface (approximately 80 feet below MSL) in 1974 to a level 50 feet below land surface (approximately 40 feet below MSL in 1981). This rise in water level is attributed to a decrease in the use of ground water in the area (Park and Stefanori, 1982). Figure 3.14 is the potentiometric surface map of the Tertiary limestone aquifer and upper Black Mingo Formation for November 1982-January 1983. Based on this map, the approximate elevation of the potentiometric surface is ten feet below NGVD or 50 feet below land surface on the Charleston AFB. With the elevation of the water table occurring at approximately 30 feet above NGVD and the potentiometric surface of the Tertiary limestone aquifer and upper Black Mingo Formation occurring at ten feet below MSL, there exists a potential for downward vertical ground-water movement where the Cooper Formation is not totally confining.

The Black Mingo Formation which underlies the Santee Limestone, is often penetrated by wells in the area. Water production is a combination from both the Santee and the Black Mingo. Ground water in the Black Mingo (Tertiary sand aquifer) is from clayey sands which often remain in an "open hole" state after the well is drilled.

The Cretaceous aquifer system, underlying the Black Mingo, yields water under flowing artesian conditions. The major producing zone within the system is a coarse-grained sand in the Black Creek Formation. Most area wells in the system range in depth from 1,200 to 2,200 feet below land surface and produce several hundred gallons of water per minute. The Cretaceous aquifer system wells are located within the city limits of Charleston near the Cooper River.

FIGURE 3.14


POTENTIOMETRIC SURFACE MAP
OF
TERTIARY LIMESTONE AND UPPER
BLACK MINGO FORMATION
VICINITY OF CAFB AND DFSP
November 1982-January 1983
40
30
20
10
0
-5
-10
30
20
10
0
0
CAFB
DFSP
ASHLEY
RIVER
COOPER RIVER
EDISTO RIVER
STONO RIVER
JAMES ISLAND
Atlantic Ocean
N
SCALE 0 5 MILES
LEGEND
—5— POTENTIOMETRIC SURFACE CONTOUR. DATUM IS NGVD OF 1929.
SOURCE: PARK, 1983 (PRELIMINARY DATA)

Ground-Water Quality

Ground-water quality in the shallow aquifer has been investigated by the South Carolina Department of Health and Environmental Control (SCDHEC). The ground-water quality is generally good. The chemical analysis of a shallow aquifer well on the SCDHEC District office property near the Charleston AFB is given in Table 3.5. Ground-water quality in the shallow aquifer has been impacted by on-base and off-base activities and operations but a complete assessment of the impact has not been made. The off-base impact has been from numerous solid waste disposal facilities in the area.

The shallow aquifer ground-water quality underlying the DFSP has been impacted by the 1975 leak of JP-4 fuel from fuel storage tank Number 1. An estimated 83,000 gallons of JP-4 fuel leaked from the tank. Approximately 21,000 gallons of fuel was recovered in late 1975 and early 1976 by two well-point systems consisting of four-inch diameter wells placed to depths of 17 feet and 20 feet below ground. A large diameter recovery well was also installed. The initial content of JP-4 fuel in the ground water ranged from pure fuel floating on the water table to 22 micrograms per liter of fuel at a depth of 25 feet below ground. A sample obtained after five weeks of fuel recovery indicated an approximate fuel content of 0.09 percent (Talts and others, 1976). Another investigation of the DFSP ground-water contamination was conducted in 1981 and 1982. Water-table fluctuations were observed in monitor wells during the investigation which apparently caused a release of hydrocarbons from the unsaturated zone beneath the DFSP. In April 1982, the oil and grease ranged from 2.2 to 22.0 milligrams per liter (mg/l). Only one inch of fuel thickness in one well was measured; all other wells displayed only a sheen on the water surface. Off-base occurrences of fuel oil smells and the confirmed presence of hydrocarbons in the shallow aquifer during 1979 and 1980 indicate the underground movement of fuel northward toward Goose Creek (Linton, 1979 and 1980). There are presently no monitoring wells off-base of the DFSP.

Ground-water quality in the Tertiary limestone, Tertiary sand and Cretaceous aquifer systems has been reported by Siple (1967), SCWRC (1974) and Park (1983). Siple reported that brackish water (250 mg/l chloride) extended at least 30 miles inland and had invaded all of the

TABLE 3.5

GROUND-WATER QUALITY DATA FOR CHARLESTON AFB, DFSP AND VICINITY

Well Identification	Date	Selected Parameters: pH	Specific Conductance (umhos/cm)	Total Dissolved Solids (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	Iron (ug/l)	Sulfate (mg/l)	Calcium (mg/l)	Magnesium (mg/l)	Total Organic Carbon (mg/l)	Oil & Grease (mg/l)
18CDg1, Raybestos-Manhattan industrial Tslms and Tbm well	02/15/80	8.3	2200	1384	265	4.8	41	82	4.7	5.1	NA	NA
18CCg2, Westvaco Corporation industrial Tslms and Tbm well	12/21/82	8.7	1800	1204	250	5.2	101	56	4.5	6	NA	NA
19CCi1, SCDHEC regional shallow aquifer monitor well	05/15/79	5.9	140	160	NA	0.0	2.0	19	20	1.1	3.7	NA
B-105, DFSP upgradient shallow aquifer monitor well	04/19/82	6.4	187	NA	NA	NA	NA	NA	NA	NA	5.0	3.3
W-104, DFSP downgradient shallow aquifer monitor well	04/19/82	4.8	750	NA	NA	NA	NA	NA	NA	NA	435.0	4.4

Notes: NA = Not analyzed
Tslms = Santee Limestone
Tbm = Black Mingo Formation

See Figure 3.15 for well locations

umhos/cm = micromhos per centimeter
mg/l = milligrams per liter
ug/l = micrograms per liter

Source: Glowacz and others, 1980; Park, 1983; Dames and Moore, 1982 geologic units down to the Black Creek Formation within the Cretaceous aquifer system. The Tertiary limestone and sand aquifer systems in Charleston were pumped so heavily in years prior to 1969 that a deep cone of depression had developed, resulting in salt-water encroachment. Chloride levels exceeded 400 mg/l (SCWRC, 1974). More recent data (Park, 1983) indicates that wells tapping the Tertiary limestone aquifer and Black Mingo Formation south of Charleston have chloride levels ranging from 30 to 730 mg/l. Fluoride levels range from 1.4 to 3.6 mg/l. Wells deeper than 530 feet contain brackish water. Ground-water quality data for the Tertiary and Cretaceous aquifer systems is tabulated in Table 3.5.

Ground-Water Use

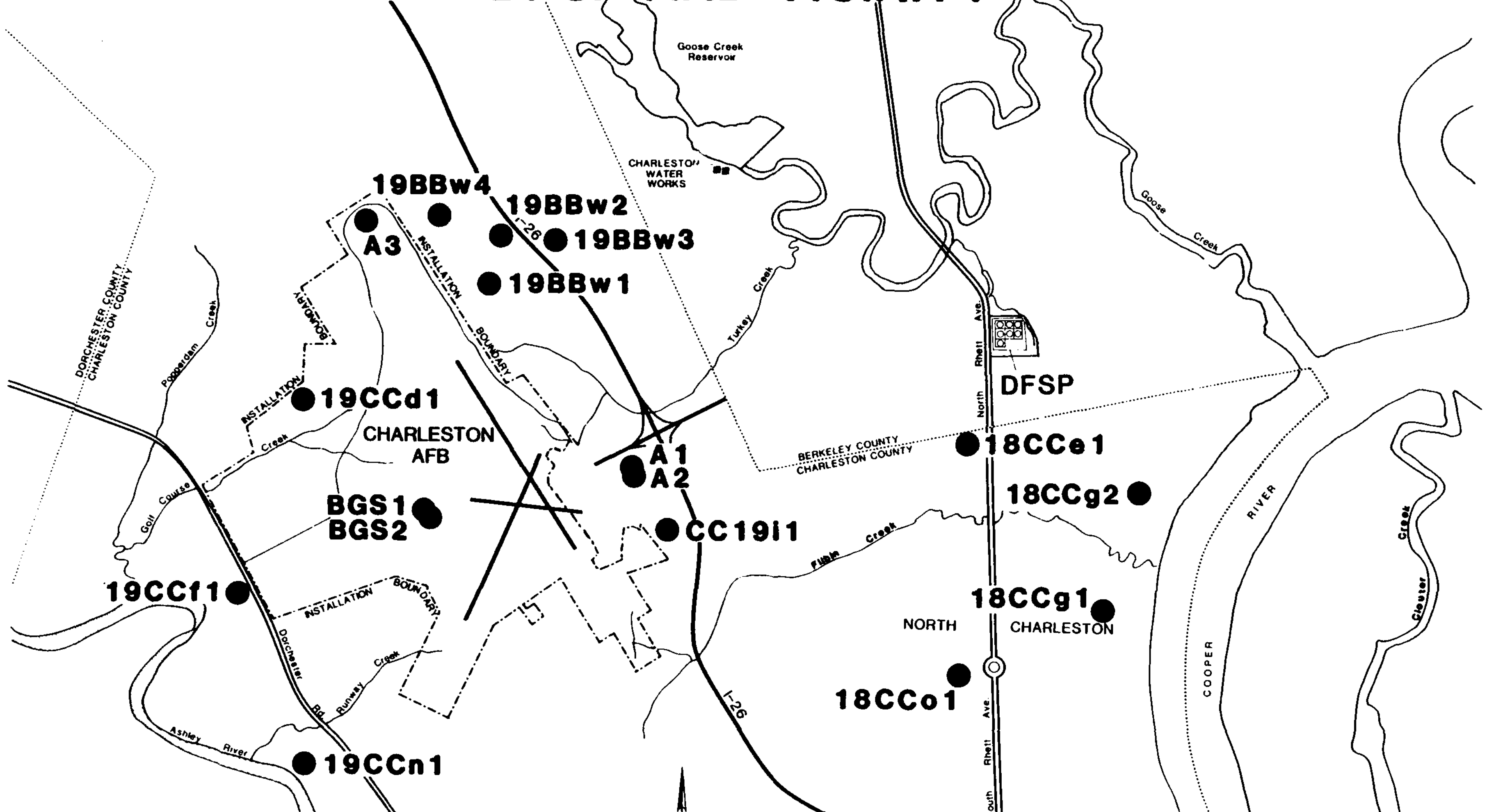
Ground-water within the vicinity of Charleston AFB and the DFSP is used for industrial, domestic, and limited public supply purposes. The wells generally vary in depth from 300 to 500 feet below ground surface and tap the Tertiary limestone aquifer and upper Black Mingo Formation (Park, 1983). Since a public surface-water system exists in the area, most drinking water in the area is not obtained from ground-water sources. The only known well of limited public use (swimming pool) is the well owned by Westvaco Corporation located approximately 3,500 feet south of the DFSP. The domestic uses are reportedly for home heat pump systems and lawn and garden irrigation (Park, 1983). The locations of wells in the vicinity are shown on Figure 3.15 and the data for the wells are tabulated in Table 3.6.

BIOTIC ENVIRONMENT

The biotic environment of Charleston AFB includes six major biotic communities. One threatened and one endangered animal species are known to inhabit the base. The DFSP, an industrial development, does not support significant vegetation nor animal habitation.

The six major biotic communities on the Charleston AFB are open water, fresh-water marsh, swamp forest, oak-pine forest, man-influenced areas and man-dominated areas. The open water areas of the base are limited to the ponds, natural streams and drainage areas and ditches created by phosphate strip mining activities. Typical plant life in

WELL LOCATION MAP OF CHARLESTON AFB, DFSP AND VICINITY



NOTE: SEE TABLE 3.6 FOR WELL DATA
SEE FIGURE 3.13 FOR DETAIL MAP OF DFSP WELLS

SCALE 0 1 MILE

SOURCE: SCDHEC, 1983; SCWRC, 1983; CHARLESTON AFB FILES

FIGURE 3.15

TABLE 3.6

WATER WELL DATA FOR CHARLESTON AFB, DFSP AND VICINITY

Well ID	Owner &/or Location	Depth (feet) Casing	Screen	Total	Diameter (inches)	Hydrogeologic Unit(s) Tapped By Well	Water Level (feet) Above (+) or Below (-) Land Surface	Date	Approximate Elevation Above (+) or Below (-) NGVD	Yield (gpm)	Use
A1	Ukn, northeast of municipal airport	Ukn	Ukn	Unk	Ukn	Ukn	Ukn	--	--	Ukn	Abandoned
A2	Ukn, northeast of municipal airport	Ukn	Ukn	Ukn	Ukn	Ukn	Ukn	--	--	Ukn	Abandoned
A3	Charleston AFB, dug well at end of Runway 15/33	None	None	6	48	Qlf	-2	06/09/83	+33	Ukn	Unused
BGS1	Charleston AFB, base gas station	NR	NR	6	NR	do	NR	--	--	NR	Monitoring Well
BGS2	Charleston AFB, base gas station	NR	NR	6	NR	do	NR	--	--	NR	Monitoring Well
CC19i1	SCDHEC, EQC District Office, Airport Road	13	4	17	2	do	-4.2	07/01/83	+31	NR	Monitoring Well
18CCo1	Viola Bunn, North Charleston	126	OH	325	4	Tcf-Tslms	NR	--	--	NR	Unused
18CCg1	Raybestos-Manhattan, North Charleston	308	OH	440	8	Tslms	NR	--	--	310	Industrial
18CCg2	Westvaco Corporation, North Charleston	NR	NR	450	6	do	NR	--	--	NR	Industrial
18CCe1	Westvaco Corporation, North Charleston	198	OH	361	6	Tcf-Tslms	NR	--	--	40	Public Supply (Swimming Pool)
193Bw1	James King, Midland Park (northeast of base)	NR	OH	300	4	do	NR	--	--	NR	Domestic
19BBw2	Midland Park Elementary School, Midland Park (northeast of base)	82	OH	359	6	do	NR	--	--	40	Unused
19BBw3	Hughes Motor Lines, Midland Park (northeast of base)	86	OH	365	6	do	NR	--	--	115	Industrial
19BBw4	Tom Youmans, Midland Park (northeast of base)	NR	OH	321	NR	do	NR	--	--	NR	Domestic
19CCd1	Virginia Polytechnic Institute, Charleston AFB (near Bldg. 371)	1002	None	1002	2	None	NR	--	--	0	Abandoned Geothermal Test Hole
19CCf1	Southern Bell Telephone Company, Lambs (southwest of base)	117	OH	353	6	Tcf-Tslms	NR	--	--	NR	Abandoned
19CCn1	Mike Crombie, North Charleston	45	OH	380	4	do	NR	--	--	NR	Domestic

TABLE 3.6 (Continued)

WATER WELL DATA FOR CHARLESTON AFB, DFSP AND VICINITY

Well ID	Owner &/or Location	Depth (feet) Casing	Depth (feet) Screen	Depth (feet) Total	Diameter (inches)	Hydrogeologic Unit(s) Tapped By Well	Water Level (feet) Above (+) or Below (-) Land Surface	Water Level (feet) Date	Water Level (feet) Approximate Elevation Above (+) or Below (-) NGVD	Yield (gpm)	Use
(DFSP Wells) B-101	U.S. Defense Logistics Agency, (DLA), Alexandria, VA (Installed by Dames & Moore)	3	30	33	6	Qlf	-9.47	02/19/82	+32.88*	NR	Monitoring Well
B-102	do	do	do	do	do	do	-7.43	do	+37.11	NR	Monitoring Well
B-103	do	do	do	do	do	do	-10.41	do	+34.70	NR	Monitoring Well
B-104	do	do	do	do	do	do	-2.54	do	+34.86	NR	Monitoring Well
B-105	do	do	do	do	do	do	-2.24	do	+36.82	NR	Monitoring Well
B-106	do	do	do	do	do	do	-5.61	do	+37.65	NR	Monitoring Well
B-107	do	do	do	do	do	do	-1.3	do	+36.70	NR	Monitoring Well
B-108	do	do	do	do	do	do	-4.96	do	+35.19	NR	Monitoring Well
B-109	do	do	do	do	do	do	-8.54	do	+34.36	NR	Monitoring Well
W-101	do	do	do	do	do	do	-14.11	do	+24.62	NR	Monitoring Well
W-102	do	do	do	do	do	do	-13.01	do	+25.25	NR	Monitoring Well
W-103	do	do	do	do	do	do	-13.17	do	+26.37	NR	Monitoring Well
W-104	do	do	do	do	do	do	-12.33	do	+26.71	NR	Monitoring Well
W-105	do	do	do	do	do	do	-13.44	do	+27.20	NR	Monitoring Well
W-106	do	do	do	do	do	do	-12.21	do	+28.33	NR	Monitoring Well
W-107	do	do	do	do	do	do	-8.13	do	+31.12	NR	Monitoring Well
W-108	do	do	do	do	do	do	-7.42	do	+31.83	NR	Monitoring Well
Three Monitoring Wells	(Installed by SCDHEC)	NR	NR	17	4	do	NR	--	--	NR	Monitoring Well
Recovery Well	(Installed by DLA)	9	10	19	36	do	NR	--	--	NR	Fuel Recovery Well
Five Monitoring Wells	do	NR	NR	NR	4	do	NR	--	--	NR	Monitoring Wells

Notes:
Id = Identification
NR = Not Recorded
OH = Open Hole
Qlf = Ladson Formation
Tcf = Cooper Formation
Tslms = Santee Limestone
Ukn = Unknown

See Figures 3.11 and 3.13 for well locations.
gpm = gallons per minute

* = B-101 thru W-108 elevations as reported by Dames & Moore, 1982.

Source: Charleston AFB Files; Dames & Moore, 1982; Park, 1983; SCDHEC, 1983; and Talts and Others, 1976.

open water areas includes duckweeds, mosquito fern, figwort and duck potato. Typical animal life includes various amphibians, turtles, snakes, and the American alligator (a Federally-listed threatened species). The fresh-water marsh community is common on base and supports many varieties of plant and animal life. The marshs are usually formed by poorly drained ditches and open water areas. A marsh area was formed by the drainage of a relatively large pond near the explosives disposal area. Drainage reportedly occurred due to the sand excavation operations adjacent to the base (Mooney, 1983). The swamp forest area is limited to the low lying are in the vicinity of the Charleston airport expansion. The most abundant trees in the swamp forest area are sweetgum, red maple, water ash, swamp chestnut oak, willow oak, water oak, loblolly pine, and southern magnolia. Typical animal life in the swamp forest areas include the white-tail deer, cottontail rabbit, bobcat, fox, raccoon, weasel, striped skunk, and various species of birds. The oak-pine forest areas are sub-divided into three areas: upland forest containing turkey oak and loblolly pine in the golf course area; sand ridge oak-pine forest containing live oak trees in old pond margins and lowland oak-pine forest containing loblolly pine trees in swamp forest margins. A wide variety of amphibians, reptiles, birds, and larger animals are common in each of the oak-pine forests. The only Federally-listed endangered species on the Charleston AFB and a rare inhabitant of the oak-pine forests is the Red-cockaded Woodpecker. Buffer zones in timber harvesting areas have been established to protect the nests of the Red-cockaded Woodpecker (Environmental Quality Award Nomination, 1982).

The two biotic communities which include man, are the man-influenced areas and the man-dominated areas. The former includes areas such as power line and railroad right-of-ways in which vegetation is cut only when it presents a maintenance or aesthetic problem. The latter includes areas such as grass along side roads, taxiways, dwellings and shops. Typical grasses in these area include: common Bermuda, Centipede, Rye and St. Augustine. The eastern mole, opossum, rats, mice and various species of birds may adapt in the man-influenced and man-dominated areas (Environmental Narrative, 1975).

SUMMARY OF ENVIRONMENTAL SETTING

The environmental setting data for the Charleston AFB and DFSP indicate the following data are important when evaluating past hazardous waste disposal practices.

1. The mean annual precipitation is 51.4 inches; the net precipitation is +8 inches and the 1-year 24-hour rainfall event is four inches. These data indicate an abundance of rainfall in excess of evaporation plus a potential for storms to create excessive runoff.

2. The soils on base are typically sand and sandy loam and normally are well drained, but shallow clays are present locally. In areas where the natural soils have been disturbed and/or removed as in landfills, the shallow clays would be altered or removed therefore the vertical and horizontal permeabilities would vary depending upon materials and compaction with the landfill. The shallow aquifer outcrops on the base with water-table levels as high as two feet below ground. These data indicate relatively permeable soils with high water tables.

3. The Cooper Formation, the major confining bed in the area, occurs at approximately 35 feet below ground. This fact indicates that ground water will normally discharge into nearby surface streams or breakout at springs within a local area.

4. The Tertiary limestone and sand aquifers underlying the Cooper Formation have lower hydraulic heads (static water levels) than the hydraulic head within the shallow aquifer; therefore, a potential exists for vertical downward movement of water where the Cooper Formation is not totally confining. Even though the Tertiary aquifers contain brackish water, there is the potential for leachate to impact these aquifers where access is possible through permeable zones of the Cooper Formation or through improperly constructed wells.

5. The Charleston AFB lies within two drainage basins, the Ashley River and the Cooper River, both of which are affected by salt-water tidal fluctuations. The DFSP lies solely within the Cooper River basin. These data indicate that the surface-water resources of the area are important for tidal water animal species in terms of a need for a delicate water quality balance and in terms of possible human consumption of the animals. This factor is important due to the interconnection of ground and surface water in terms of contaminants in ground water potentially moving to surface-water streams.

6. The Red-cockaded Woodpecker (a Federally-listed endangered species) and the American alligator (a Federally-listed threatened species) inhabit selected small portions of the Charleston AFB. There are no endangered or threatened species on the DFSP property.

SUMMARY OF ENVIRONMENTAL SETTING FOR NORTH AUXILIARY AIR FIELD

The environmental setting data for North Auxiliary Air Field is discussed in Appendix D. The following data are important when evaluating past hazardous waste disposal practices.

1. The mean annual precipitation is 46.37 inches; the net precipitation is +4 inches and the one-year 24-hour rainfall event is 3.3 inches. These data indicate a relative abundance of rainfall in excess of evaporation plus a potential for storms to create excessive runoff.

2. The soils on base are typically loamy sand with pebbles and gravel and are poorly drained. The Orangeburg Group sediments (unconfined and confined aquifers) outcrop on base with water-table levels moderately deep (30 to 100 feet). Perched water-table zones may exist on base as evidenced by wet-weather springs. Numerous intermittent streams originate in the wetlands south of the runway. The soils in the wetlands are sandy and very permeable. These data indicate moderately permeable

soils with low-water tables on a majority of the base, but very permeable soils with high water tables in the wetlands. These factors are important in that leachate if present will have more potential for movement in the sands of the wetland areas more so than in the Orangeburg Group sediments.

3. The ground water within the Orangeburg Group sediments and the alluvial deposits in the wetland areas may discharge into nearby streams. This fact indicates an interconnection between the ground and surface-water systems. This is important in assessing the movement of leachate from a waste site to nearby streams.

4. The confined aquifers (Black Mingo, Peedee and Middendorf (?) Formations) underlying the Orangeburg Group aquifers have higher hydraulic heads (static water levels) than the hydraulic head within the confined portions of the Orangeburg Group underlying the base. Therefore, an upward vertical ground-water movement condition would prevent any potential contaminants from naturally reaching the Black Mingo, Peedee and Middendorf (?) Formations. This is important in determining the vertical migration of any potential contaminants.

5. There are no Federally-listed endangered or threatened animal or plant species known to occur on the North Auxiliary Air Field.

CHAPTER 4

FINDINGS

To assess hazardous waste management at Charleston Air Force Base, past activities of waste generation and disposal methods were reviewed. This chapter summarizes the hazardous waste generated by activity; describes waste disposal methods; identifies the disposal sites located on the base; and evaluates the potential for environmental contamination.

PAST SHOP AND BASE ACTIVITY REVIEW

A review was conducted of current and past waste generation and disposal methods at Charleston Air Force Base with the objective of identifying those base activities that generated hazardous waste. This review consisted of a search of files and records, interviews with base employees, and site inspections.

The source of most hazardous wastes on Charleston AFB can be associated with any of the activities listed below:

- Industrial shops
- Fire protection training
- Pesticide utilization
- Waste storage areas
- Fuels management

The following discussion addresses only those wastes generated on base which are either hazardous or potentially hazardous. Hazardous wastes are those substances referenced by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) or by South Carolina regulations concerning hazardous waste. A potentially hazardous waste is one which is suspected of being hazardous although insufficient data are available to fully characterize the waste material.

Industrial Operations (Shops)

Since Charleston AFB opened in 1941, the main function of the industrial operations (shops) on the base has been to provide maintenance support for troop and supply transport missions. Activities have included aircraft equipment maintenance, ground equipment maintenance, base facilities maintenance, and welfare and recreation. A list of past and present industrial shops was obtained from the Bioenvironmental Engineering Services (BES) files. Information contained in the files indicated those shops which generate hazardous waste and/or handle hazardous materials. A summary review of the shop files is presented in Appendix F, Master List of Industrial Shops.

For the shops known to generate hazardous wastes, interviews with personnel familiar with shop activities were conducted. The information obtained from interviews and base records has been summarized in Table 4.1. For each generator of hazardous wastes, this table presents the shop location, waste materials generated, quantities of wastes generated, and a disposal method timeline. Many of the disposal methods were identified from information obtained from past and present personnel of Charleston AFB. The waste quantities shown in Table 4.1 are based on verbal estimates given by present shop personnel at the time of the interviews. The shops that have generated insignificant quantities or no hazardous waste are not listed in Table 4.1.

When Charleston Army Air Base first opened in 1941, most of the industrial shops were located east of the runways, near the Municipal Airport. Shop activities continued there until the end of World War II, in 1945. In 1946, control of the land occupied by the Army during the war returned to the City of Charleston. When military activity on the base resumed in 1953, shops were located west of the runways and have continued to locate in that vicinity, along Graves Road and the flightline. The runways are part of Charleston AFB and are used by both the Air Force and the Charleston County Aviation Authority under a joint use agreement.

From the time operations began at the base (1941) until the early 1970's, most combustible wastes generated at the various facilities throughout the base were brought in drums to fire protection training

TABLE 4.1

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1940 1950 1960 1970 1980
81st AERIAL PORT SQUADRON				
FLEET SERVICE	166	OVERSEAS IN FLIGHT TRASH*	ESTIMATE NOT AVAILABLE	INCINERATION
1361st AUDIOVISUAL SQUADRON				
AUDIOVISUAL LAB.	235	SPENT PHOTO FIXER	15 GALS./MO.	TAKEN IN JUGS TO NDI SHOP FOR SILVER RECOVERY
AVIONICS MAINTENANCE SQUADRON				
PMEL	707	CONTAMINATED MERCURY	<1 GAL./YR.	BOTTLED AND SENT TO ROBBINS AFB FOR RECYCLING
CIVIL ENGINEERING SQUADRON				
ENTOMOLOGY	717	PESTICIDE RESIDUE AND WASH WATER	50 GALS./DAY	STORM DRAIN, FRENCH DRAIN, SANITARY SEWER, REUSED, CONTRACTOR
GOLF COURSE MAINTENANCE	371	PESTICIDE RESIDUE, CLEANING SOLVENT, WASH WATER	50 GALS./MO.	STORM DRAIN
		WASTE OIL	2 GALS./WK.	DPDO
		EMPTY CANS	20 CANS/YR.	LANDFILL NO 3 OR 4, GENERAL REFUSE
GROUNDS MAINTENANCE	666	WASTE OILS, SOLVENTS	10 GALS./MO.	OFF BASE FPTA, FPTA NO 1, FPTA NO 2, FPTA NO 3 OR LANDFILL NO 4, DPDO
POWER PRODUCTION	659/2303	OILS, HYDRAULIC FLUID, DIESEL FUEL	50 GALS./MO.	OFF BASE FPTA, FPTA NO 1, FPTA NO 2, FPTA NO 3 OR LANDFILL NO 4, DPDO
		LEAD ACID BATTERIES	6/MO.	CONTENTS NEUTRALIZED AND DUMPED ONTO GROUND, BATTERIES SENT TO DPDO

KEY

———— CONFIRMED TIME FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME FRAME DATA BY SHOP PERSONNEL

NOTES

FPTA FIRE PROTECTION TRAINING AREA

*DISPOSAL BY INCINERATION (USDA REQUIREMENTS)

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL (1940–1980)
CIVIL ENGINEERING SQUADRON (cont'd)				
POL MAINTENANCE	659	EQUIPMENT FILTERS	90 240 FILTERS/YR.	WEATHERED AND BURNED AT LANDFILL OR FPTA; DRUMMED AND DISPOSED OF BY DPDO
		JP-4 TANK CLEANING SLUDGE	ESTIMATE NOT AVAILABLE	WEATHERED AND DISPOSED OF AT HARDFILL AREAS; NO RECENT TANK CLEANING
HEATING PLANT MAINTENANCE	431/2492	COAL ASH	ESTIMATE NOT AVAILABLE	1953 ASH DISPOSAL AREAS 1973
STRUCTURAL	661	SOLVENTS, PAINT THINNER, WASTE PAINT	<1 GAL./MO.	OFF BASE FPTA; FPTA NO 1; FPTA NO.2; FPTA NO 3 OR LANDFILL NO 4; DPDO
PAINT SHOP	659	PAINT	5 GALS./MO.	DPDO
		PAINT THINNER	15 GALS./MO.	OFF BASE FPTA; FPTA NO 1; FPTA NO 2; FPTA NO 3 OR LANDFILL NO 4; DPDO
USAF CLINIC				
DENTAL CLINIC	500	SPENT PHOTO FIXER	8 GALS./MO.	ELECTROLYTIC SILVER RECOVERY AT DENTAL CLINIC. SILVER SCRAPS SENT TO MEDICAL SUPPLY
MEDICAL X RAY	1000	PHOTO FIXER	20 GALS./MO.	CARTRIDGE SILVER RECOVERY AT MEDICAL X RAY; TAKEN BY JUG TO NDI SHOP FOR SILVER RECOVERY; ELECTROLYTIC SILVER RECOVERY AT MEDICAL X RAY

KEY

——— CONFIRMED TIME FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME FRAME DATA BY SHOP PERSONNEL

NOTE

FPTA FIRE PROTECTION TRAINING AREA

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1940 1950 1960 1970 1980
437 FIELD MAINTENANCE SQUADRON				
AGE BRANCH	548/575/576	WASTE OIL	300 GALS./MO.	OFF BASE FPTA — FPTA NO 1 — FPTA NO 2 — FPTA NO 3 OR LANDFILL NO 4 — DPDO
		PD-680	60 GALS./MO.	OFF BASE FPTA — FPTA NO 1 — FPTA NO 2 — FPTA NO 3 OR LANDFILL NO 4 — DPDO
		WASHRACK WATER	ESTIMATE NOT AVAILABLE	OIL/WATER SEPARATOR CE OR CONTRACTOR SERVICED
ENGINE TEST CELL	545	JP-4, WASTE OILS, GREASE	15-20 GALS./MO.	OFF BASE FPTA — FPTA NO 1 — FPTA NO 2 — FPTA NO 3 OR LANDFILL NO 4 — UNDERGROUND COLLECTION CE OR CONTRACTOR SERVICED
ENVIRONMENTAL SYSTEMS	58	TRICHLOROETHYLENE	1 GAL./MO.	OFF BASE FPTA — FPTA NO 1 — FPTA NO 2 — FPTA NO 3 OR LANDFILL NO 4 — DPDO
FUEL SYSTEMS	532/517	FUEL WASTE	40 GALS./MO.	OFF BASE FPTA — FPTA NO 1 — FPTA NO 2 — FPTA NO 3 — DPDO
GAS TURBINE ENGINE	548	TURBINE OIL, OIL	60 GALS./MO.	DPDO
MACHINE SHOP	536	PD-680	40 GALS./YR.	OFF BASE FPTA — FPTA NO 1 — FPTA NO 2 — FPTA NO 3 OR LANDFILL NO 4 — DPDO
NDI	536	SPENT PENETRANT, EMULSIFIER	1 GAL./MO.	SANITARY SEWER
		SILVER FROM SILVER RECOVERY	1000 G./MO.	DPDO
CORROSION CONTROL	536	PAINTS, THINNERS, MEK	55 GALS./WK.	OFF BASE FPTA — FPTA NO 1 — FPTA NO 2 — FPTA NO 3 OR LANDFILL NO 4 — DPDO
		TOLUENE	5-10 GALS./MO.	OFF BASE FPTA — FPTA NO 1 — FPTA NO 2 — FPTA NO 3 OR LANDFILL NO 4 — DPDO

KEY

——— CONFIRMED TIME FRAME DATA BY SHOP PERSONNEL

------ ESTIMATED TIME FRAME DATA BY SHOP PERSONNEL

NOTE

FPTA FIRE PROTECTION TRAINING AREA

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1940 1950 1960 1970 1980
FIELD MAINTENANCE SQUADRON (cont'd)				
PNEUDRAULICS (HYDRAULICS)	532	HYDRAULIC FLUID	500 GALS./MO.	OFF BASE FPTA → FPTA NO.1 → FPTA NO.2 → FPTA NO.3 OR LANDFILL NO.4 → DPDO
		PD-680	55 GALS./MO.	
AERO REPAIR	532/570	PD-680	55 GALS./MO.	OFF BASE FPTA → FPTA NO.1 → FPTA NO.2 → FPTA NO.3 OR LANDFILL NO.4 → DPDO
REFURBISHING HANGAR	570	PAINT STRIPPER	1 QT./WK.	OFF BASE FPTA → FPTA NO.1 → FPTA NO.2 → FPTA NO.3 OR LANDFILL NO.4 → DPDO
BATTERY SHOP (ELECTRIC SHOP)	58	INHIBISOL OR TRICHLOROETHYLENE, OIL	4 GALS./WK.	FPTA NO.1 → FPTA NO.2 → FPTA NO.3 OR LANDFILL NO.4 → DPDO
		SULFURIC ACID	3 GALS./WK.	NEUTRALIZED TO SANITARY SEWER
JET ENGINE SHOP	544/3594	OIL	600 GALS./MO.	OFF BASE FPTA → FPTA NO.1 → FPTA NO.2 → FPTA NO.3 OR LANDFILL NO.4 → DPDO
		JP-4	100 GALS./MO.	
		HYDRAULIC FLUID, OIL, TCE	100 GALS./MO.	
WHEEL AND TIRE SHOP	574	DEGREASER	50 GALS./MO.	OFF BASE FPTA → FPTA NO.1 → FPTA NO.2 → FPTA NO.3 OR LANDFILL NO.4 → DPDO
		PAINT STRIPPER	50 GALS./MO.	
		PD-680	50 GALS./MO.	
AIRCRAFT WASHRACK	59	WASH WATER CONTAMINATED WITH PD-680, PAINT STRIPPER, AIRCRAFT SOAP	4,000 GALS./YR.	OIL/WATER SERARATOR SERVICED BY CONTRACTOR DISCHARGE TO SANITARY SEWER

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME FRAME DATA BY SHOP PERSONNEL

NOTE

FPTA FIRE PROTECTION TRAINING AREA

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1940 1950 1960 1970 1980
MORALE-WELFARE AND RECREATION				
AUTO HOBBY SHOP	637	WASTE OIL, MINERAL SPIRITS	55 GALS./MO.	OFF-BASE CONTRACTOR
ORGANIZATIONAL MAINTENANCE SQUADRON				
INSPECTIONS	700	HYDRAULIC FLUID	24 QT./MO.	OFF BASE FPTA, FPTA NO. 1, FPTA NO. 2, FPTA NO. 3 OR LANDFILL NO. 4, DPDO
		PD-680	<1 GAL./MO.	
SUPPORT EQUIPMENT	710	UNUSED PAINT	2 GALS./MO.	DPDO
TRANSPORTATION SQUADRON				
CC' ́OSITE: ALL SHOPS IN BUILDINGS 407 AND 168	407/168	BATTERIES	0 10/MO.	ACID NEUTRALIZED TO SANITARY SEWER
		OIL	100 GALS./MO.	OFF BASE FPTA, FPTA NO. 1, FPTA NO. 2, FPTA NO. 3 OR LANDFILL NO. 4, DPDO
		FUEL	30 GALS./MO.	
		PD-680	5 7 GALS./MO.	
		HYDRAULIC FLUID	100 GALS./MO.	
REFUELING MAINTENANCE	688	WASTE OILS, FUELS, HYDRAULIC FLUID	40 50 GALS./MO.	OFF BASE FPTA, FPTA NO. 1, FPTA NO. 2, FPTA NO. 3 OR LANDFILL NO. 4, DPDO

KEY

——— CONFIRMED TIME FRAME DATA BY SHOP PERSONNEL

- - - - - - ESTIMATED TIME FRAME DATA BY SHOP PERSONNEL

NOTE

FPTA FIRE PROTECTION TRAINING AREA

TABLE 4.1 (cont'd)

INDUSTRIAL OPERATIONS (Shops)

Waste Management

SHOP NAME	LOCATION (BLDG. NO.)	WASTE MATERIAL	WASTE QUANTITY	METHOD(S) OF TREATMENT, STORAGE & DISPOSAL 1940 1950 1960 1970 1980
87th FIGHTER INTERCEPTOR SQUADRON				
MAINTENANCE FACILITY	2000	JP-4	80 130 GALS./MO.	OFF BASE FPTA; FPTA NO 1; FPTA NO 2; FPTA NO 3 OR LANDFILL NO 4; SENT TO DPDO IN UNSEGREGATED DRUMS; DPDO
		PD-680	7 GAL./MO.	
		DRAIN OIL WASTE	7 GALS./MO.	
		HYDRAULIC FLUID	<1 GAL./MO.	
		SYNTHETIC JET OIL	<1 GAL./MO.	
OTHER ON-BASE SHOPS				
AERO CLUB	702	ENGINE OIL	8 GALS./MO.	1975 DPDO
TRIDENT TECHNICAL COLLEGE	2030	WASTE OIL, SOAP	2 QT./MO.	STORM DRAIN
		OIL	55 GALS./MO.	MOTOR POOL ON MAIN CAMPUS

KEY

——— CONFIRMED TIME-FRAME DATA BY SHOP PERSONNEL

- - - - - ESTIMATED TIME FRAME DATA BY SHOP PERSONNEL

NOTE

FPTA FIRE PROTECTION TRAINING AREA

areas and burned by the Fire Department during routine training exercises. Small quantities of chemical wastes may have also entered the landfills in use during the period. From the early 1970's until 1981, the Defense Property Disposal Office arranged for disposal of salable wastes, and the Civil Engineering Squadron disposed of the remaining wastes through an outside contractor, Fire Protection Training Area No. 3, or possibly Landfill No. 4. Presently, chemical wastes (i.e., solvents and cleaning solutions) and waste petroleum products are collected at various designated points of accumulation in labeled drums and bowsers. The Defense Property Disposal Office, located on the Charleston Naval Base in Building No. 1600, arranges for outside contractors to purchase or dispose of these wastes. Oil/water separators on the base are serviced by the Civil Engineering Squadron or an outside contractor, as arranged through the Civil Engineering Squadron. Waste petroleum products comprise the bulk of the hazardous wastes generated at Charleston AFB. From the Base Environmental Engineer's files, there is an average of 2400 gallons of waste synthetic oil, 12,400 gallons of contaminated JP-4 fuel and 10,300 gallons of waste oil generated each year.

Because the primary mission at North Auxiliary Air Field has been operational and aerial delivery training, maintenance operations have been limited to the air field facilities. Temporary facilities mostly comprised of tents have been used at this location. Presently, permanent structures include the caretaker trailer and a few storage buildings. Consequently, hazardous waste generation has been minimal. An average of 25 gallons per year of waste oil from oil changes is generated. During the 1950's, most combustible wastes were burned and buried in a landfill southeast of the main runway, north of the North Fork Edisto River.

At North Charleston Air Force Station (792nd Radar Squadron Site), facilities originally included a Civil Engineering Maintenance Building, a Heating Facility, a Sanitary Waste Treatment Facility, and a family housing area. The Air Force, after transferring a large portion of North Charleston Air Force Station to the U.S. Navy, maintains ownership of only the family housing area.

The Ground/Air Transmitter-Receiver Facility contai' ; no shops, and does not generate any hazardous wastes. It contains two PCB transformers and an underground fuel tank. No significant leakage or spills have been reported or observed at this site.

The Defense Fuel Support Point does not regularly generate hazardous wastes. Periodically, the fuel storage tanks are cleaned, producing a waste s ge. The sludge may have originally been weathered and buried in the containment area; since 1973 it has been disposed of through a contractor.

Fire Protection Training

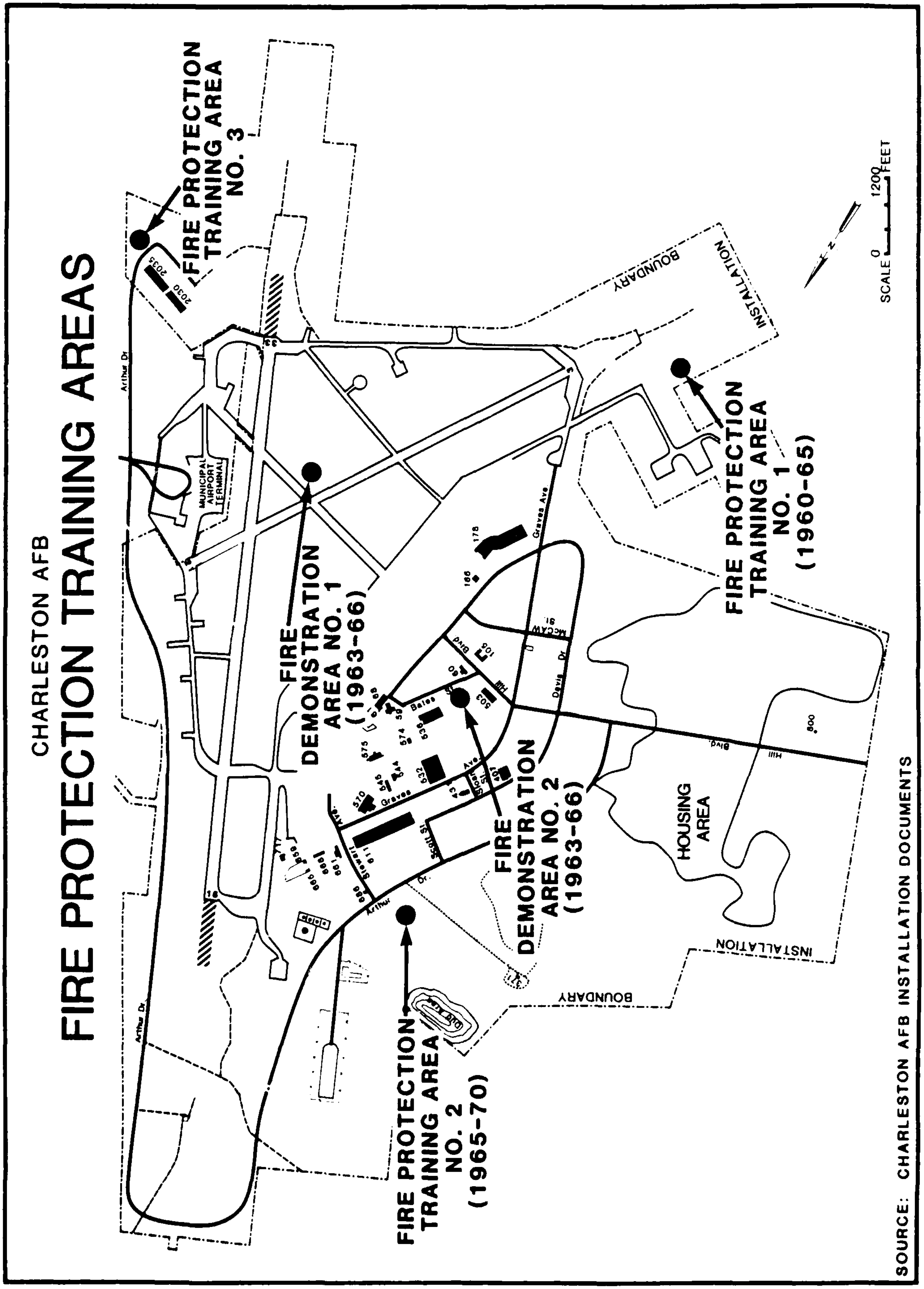
Fire protection training exercises have been conducted at three locations at Charleston AFB and one location at North Auxiliary Air Field. Fire demonstrations have been performed for open houses at two locations at Charleston AFB. The following list gives specific designations for the areas and identifies their approximate period of use. Figure 4.1 depicts the areas located at Charleston AFB and Figure 4.2 depicts the area located at North Auxiliary Air Field.

Area	Period of Operation
Fire Protection Training Area No. 1	1960-1965
Fire Protection Training Area No. 2	1965-1970
Fire Protection Training Area No. 3	1970-present
Fire Demonstration Area No. 1	1963-1966
Fire Demonstration Area No. 2	1963-1966
Fire Protection Training Area, North Auxiliary Air Field	1979-present

No information was obtained about fire protection training exercises conducted during the World War II period. From 1955 to 1960, fire protection training was conducted at an off-base site southeast of the base on leased property.

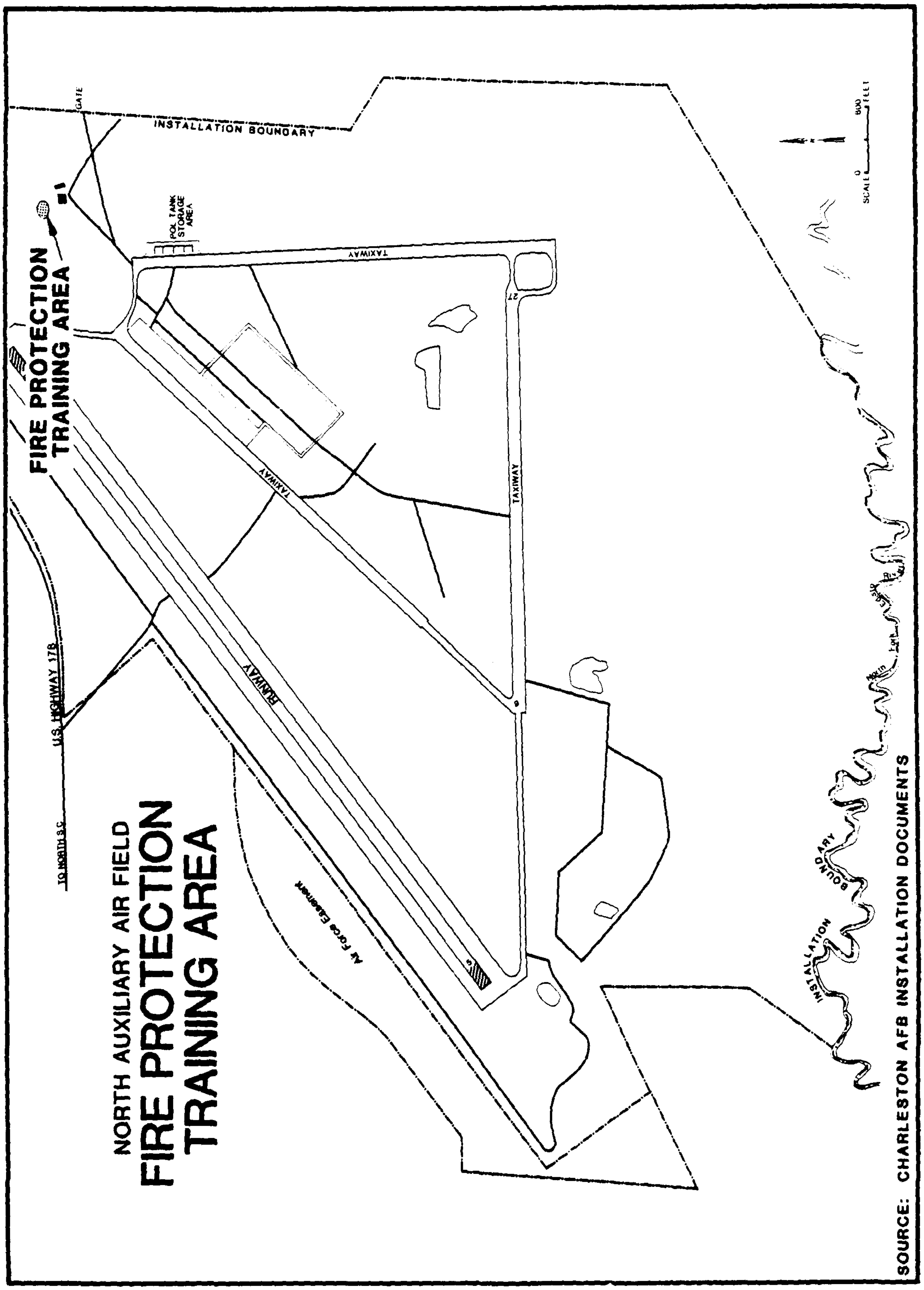
Fire Protection Training Area No. 1

From approximately 1960 to 1965, the Fire Department conducted fire protection training exercises south of the end of Runway 03. Pit construction was round with an earth berm and crushed limestone base. Contaminated JP-4 was the primary material burned, but some other waste flammables such as oil, hydraulic fluid, paint thinner, MOGAS, and AVGAS were used as well.



SOURCE: CHARLESTON AFB INSTALLATION DOCUMENTS

FIGURE 4.2


NORTH AUXILIARY AIR FIELD
FIRE PROTECTION TRAINING AREA
FIRE PROTECTION TRAINING AREA
INSTALLATION BOUNDARY
GATE
POL TANK STORAGE AREA
TAXIWAY
TAXIWAY
TAXIWAY
RUNWAY
U.S. HIGHWAY 178
TO NORTH S.C.
Air Force Easement
INSTALLATION BOUNDARY
SCALE 0 800 FEET
SOURCE: CHARLESTON AFB INSTALLATION DOCUMENTS

Training exercises were conducted an average of four to six times per month. Six to ten drums (330-550 gallons) of fuel per fire were used. Drums were moved into the pit area by hand, emptied, and removed prior to igniting the fire. At times the pit area was pre-wet with water to minimize infiltration of fuel before igniting the fire, and sprayed with water afterwards to cool. Fire fighting agents used were protein foam, chlorobromomethane, Purple K powder, and CO_2.

Fire Protection Training Area No. 2

From approximately 1965 to 1970, the Fire Department used an area now located under the tennis courts in the park. Pit construction and fire protection training practices were similar to Fire Protection Training Area No. 1. No visual evidence of the old site was observed during the site visit.

Fire Protection Training Area No. 3

From approximately 1970 to the present, the Fire Department has used an area located southeast of the Municipal Airport, near the TAC Alert Area for its fire protection training exercises. Circular pits are constructed with an earth berm and a limestone base. Only non-contaminated JP-4 is reported to have been burned in the training area, but during the initial establishment of Fire Protection Training Area No. 3 some other flammable industrial wastes may have been burned as well. An average of two fire training exercises are performed each month. Approximately 300 gallons of fuel is used per fire. A tank truck transports the fuel to the site. Fire fighting agents used include aqueous film forming foam (AFFF), dry chemicals, and Halon. Surface water runoff from the pit was evident during the site visit.

Fire Demonstration Areas No. 1 and No. 2

From 1963 to 1966, the Fire Department conducted fire fighting demonstrations south of the runway in front of the commercial air terminal (No. 1) and behind Building 49 (No. 2). The demonstrations were performed for base visitors during open houses. Approximately six fires over the three-year period were conducted at each site. About 500 gallons of JP-4 was used per fire. No visual evidence of these sites could be observed by walking over the areas today.

Fire Protection Training Area, North Auxiliary Air Field

Infrequent fire protection training exercises are performed at North Auxiliary Air Field. The site has been in use since approximately 1979. Approximately 150 gallons of diesel fuel and oil are burned every two years in the area. The primary use of the site is burning of wood and brush. Although the area was not modified prior to any fire training, contamination is unlikely because of the small amount of fuel and large amount of wood burned.

Pesticide Utilization

Pesticide applications have been conducted by Entomology Shop, Grounds, and Golf Course Maintenance personnel at Charleston AFB. A list of pesticides used on base is located in Appendix E, Table E.1. From 1962 until 1982, the Entomology Shop was located in Building 668. During this period, vehicles were washed at the Civil Engineering wash rack located near Building 665, with the wash water draining to the ground. Containers were rinsed, crushed and put into a dumpster. From at least 1971 until 1977, residues and container wash (estimated 50 gal/day) drained to a french drain located approximately eight feet north of the building. From 1977 until 1979, the residues and container wash drained onto the ground in back of the shop or to a storm sewer inlet between the railroad tracks adjacent to the shop. From 1979 until 1981, the residues and container wash were stored in 55 gallon drums to be used on ant hills. From 1981 until 1982, the residue and container wash were discharged to the sanitary sewer.

In 1982, the Entomology Shop moved to its present location in Building 714. The shop is equipped with an underground storage tank to collect container wash and waste pesticides. The tank is emptied by a licensed hazardous waste contractor who disposes of the residue off base. Currently, vehicle washing takes place adjacent to the shop, with the wash water draining to the ground. Containers are rinsed, crushed and put into the dumpster for disposal.

Grounds Shop personnel use herbicides on railroad tracks and fence lines, but do little equipment cleanup. Golf Course Maintenance personnel use insecticides, fungicides, and herbicides. Equipment cleanup takes place behind their shop (Building 371) and drains to the ground. Containers are placed into the dumpster empty but unrinsed.

Waste Storage Areas

Waste chemicals and used oils have been stored in several locations throughout Charleston AFB. In most cases, the wastes have been temporarily stored at the site of generation until the wastes are removed for final disposal. Figure 4.3 presents the location of the waste storage areas in the base and the current waste accumulation points.

Hazardous Waste Storage Area No. 1, a fenced-in area adjacent to Building No. 665 and 659, was used from 1953 to the early 1960's to store out-of-service transformers and drums of waste paint and oil. Based on an interview and an unconfirmed report, spills and leaks of the stored materials occurred in this area. The area is now the paved parking lot for Civil Engineering Squadron vehicles.

Hazardous Waste Storage Area No. 2, across from Building No. 661, was opened in 1981 by the Civil Engineering Squadron to be used as the central hazardous waste storage area prior to DPDO removal. Out-of-service transformers containing polychlorinated biphenyls (PCBs) or PCB-contaminated oils awaiting disposal are stored in a shed. Liquid wastes are stored in drums and tanks. Drums rest on wooden skids or on the gravel base underlying the storage area. Spillage of material was evident during the site visit.

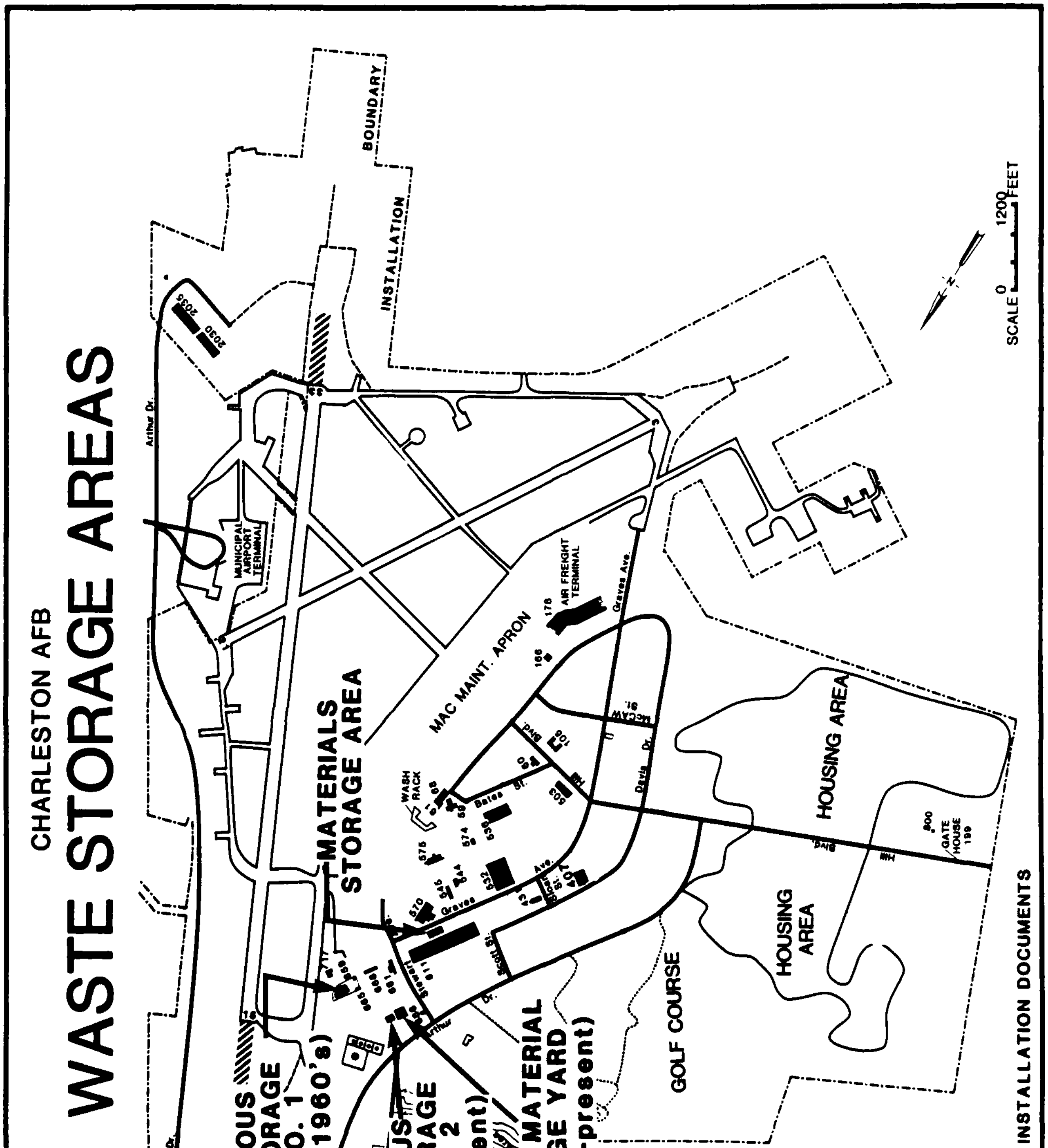
The Salvage Material Storage Yard is located adjacent to Hazardous Waste Storage Area No. 2. It has been in this location since the 1960's. Drums of solvent were emptied onto the area during the late 1960's. The site is grass covered.

The Materials Storage Area east of Building S-611 was used for outside storage of drummed hazardous materials. Spillage of miscellaneous materials from drums have occurred at this location. The area is now covered with a concrete slab.

No drummed waste storage areas exist at North Auxiliary Air Field, the North Charleston Air Force Station Site, the GATR Site, or the Defense Fuel Support Point.

Spills

The majority of spills which have occurred at Charleston AFB have involved small quantities of fuels, oils, hydraulic fluid and industrial



SOURCE: CHARLESTON AFB INSTALLATION DOCUMENTS

chemicals. The spills have primarily taken place along the flightline, in the associated maintenance shops and in material storage areas. The two largest known fuel spills which occurred at the base include: a 3,000 gallon spill which occurred on the flightline apron in the mid 1970's and was wasted into the storm sewer with over 100,000 gallons of water and a 1,000 gallon JP-4 spill which occurred in 1980 north of the aircraft wash rack and was allowed to disperse over the adjacent pad and grass and evaporate.

Three small PCB spills occurred on the base. One spill (North PCB Spill Site) occurred in 1980 outside of Building 431 when a transformer was struck by lightening. The second PCB spill (South PCB Spill Site) occurred in 1983, near Building 800. The source of the spill was a leaky transformer mounted on a pole. A third PCB leak occurred at Building 503. The leak originated from a transformer which rested on a concrete slab. The small quantity of PCB oil which leaked was completely contained. All of the PCB spills have been cleaned up. The PCB spill sites are depicted on Figure 4.4.

Because of the limited maintenance operations and the lack of reported spill incidents at North Auxiliary Air Field and the Ground/Air Transmitter-Receiver Site, it is believed that no significant fuel or chemical spills have occurred.

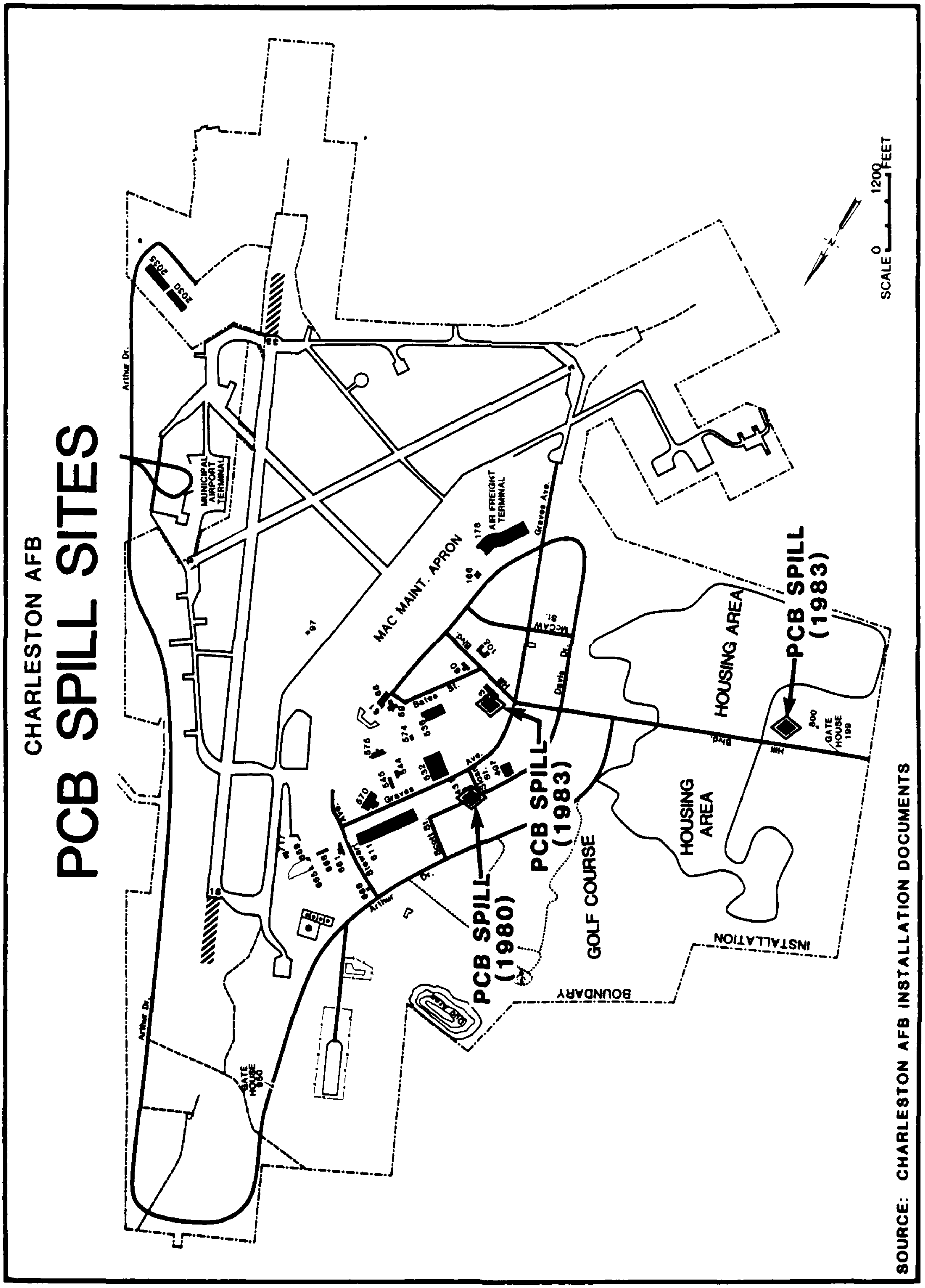
The portion of the North Charleston Air Station remaining in Air Force custody is primarily family housing, consequently it is believed that no significant fuel or chemical spills have occurred there.

A major fuel spill occurred at the Defense Fuel Support Point Tank Farm in October 1975. Approximately 83,000 gallons of JP-4 was lost from a 3,360,000 gallon above-ground storage tank (Tank No. 1). Fuel recovery efforts made through early 1976 recovered approximately 21,000 gallons. On-site monitoring wells were installed and a detailed discussion of them may be found in Chapter 3 in the section on Ground-water Quality. Migration of the fuel in the shallow aquifer has occurred.

Fuels Management

The Charleston AFB Fuels Management Storage System consists of a number of above-ground and underground storage tanks in various locations throughout the base. A list of the major storage tanks is tabulated in Table E.2, Appendix E. Fuel and oil used on the base

FIGURE 4.4



CHARLESTON AFB
PCB SPILL SITES
MUNICIPAL AIRPORT TERMINAL
MAC MAINT. APRON
AIR FREIGHT TERMINAL
PCB SPILL (1980)
PCB SPILL (1983)
PCB SPILL (1983)
HOUSING AREA
HOUSING AREA
GOLF COURSE
INSTALLATION BOUNDARY
GATE HOUSE 199
GATE HOUSE 850
Arthur Dr.
Graves Ave.
Davis Dr.
McCAW St.
Bates St.
Hill Blvd.
Stewart Ave.
Scott St.
N
SCALE 0 1200 FEET
SOURCE: CHARLESTON AFB INSTALLATION DOCUMENTS

included JP-4, other fuels, AVGAS, MOGAS (leaded and unleaded), diesel, No. 2 diesel (heating fuel) and waste oils. JP-4 fuel is pumped to the base Bulk Storage Area tanks through an 8-inch 5.4-miles pipe line from the DFSP. The base is also equipped to receive JP-4 by rail tank cars. Other fuels are delivered by tank trucks and rail tank cars.

The major above-ground tanks are located in the Bulk Storage Area. The largest of the tanks has a capacity of 2,310,000 gallons. One smaller tank has a capacity of 315,000 gallons and three have capacities of 210,000 gallons each. A 10,000 gallon above-ground tank is also located in the Bulk Storage Area. From the Bulk Storage Area fuels are pumped through 8-inch diameter underground pipes to twelve underground tanks located on the east side of the MAC Maintenance Apron. Each tank has a capacity of 50,000 gallons. From the underground tanks fuels are pumped to the flight line through numerous 6-, 8- and 10-inch diameter underground pipes.

Four separate underground tanks are located in two areas on the Charleston AFB. Two tanks, one 3,000-gallon JP-4 tank and one 1,000-gallon MOGAS tank, are located adjacent to Building 575. Two additional tanks, each 10,000 gallons of MOGAS, are located at the base service station. Underground shop tanks are located throughout the base. The fuel tanks on base have been cleaned and pressure tested periodically. The cleaning of the above-ground tanks has been accomplished as needed when sludge accumulates in the bottom of the tanks. The sludge has been removed from the base by a contractor.

DESCRIPTION OF PAST ON-BASE DISPOSAL METHODS

The facilities on Charleston AFB which have been used for the management and disposal of waste can be categorized as follows:

- Landfills
- Hardfill Areas
- Dump Sites
- Ash Disposal Sites
- Sewage Waste Treatment
- Storm Drainage
- Incineration

The waste management practices are discussed individually in the following sub-sections.

Landfills

Four landfills at Charleston AFB and four landfills at North Auxiliary Air Field used for the disposal of refuse were identified. Landfill locations at Charleston AFB are shown in Figure 4.5 and a summary of pertinent information concerning each landfill has been presented in Table 4.2. Hardfill and ash disposal sites and a dump site are also identified in Figure 4.5. Landfills at North Auxiliary Air Field are presented in Figure 4.6.

Landfill No. 1 (1953-1955)

Landfill No. 1 is located on the golf course, in the vicinity of the 9th fairway. It is approximately four acres in size, and was used between 1953 and 1955 for disposal of general refuse and possibly small amounts of industrial wastes from the shops, such as paints, solvents, and batteries. The wastes were placed in 10 feet deep trenches and filled to grade. Some daily cover was provided, but no burning took place. The site is closed and has an earth cover with grass. No exposed wastes or leachate was observed.

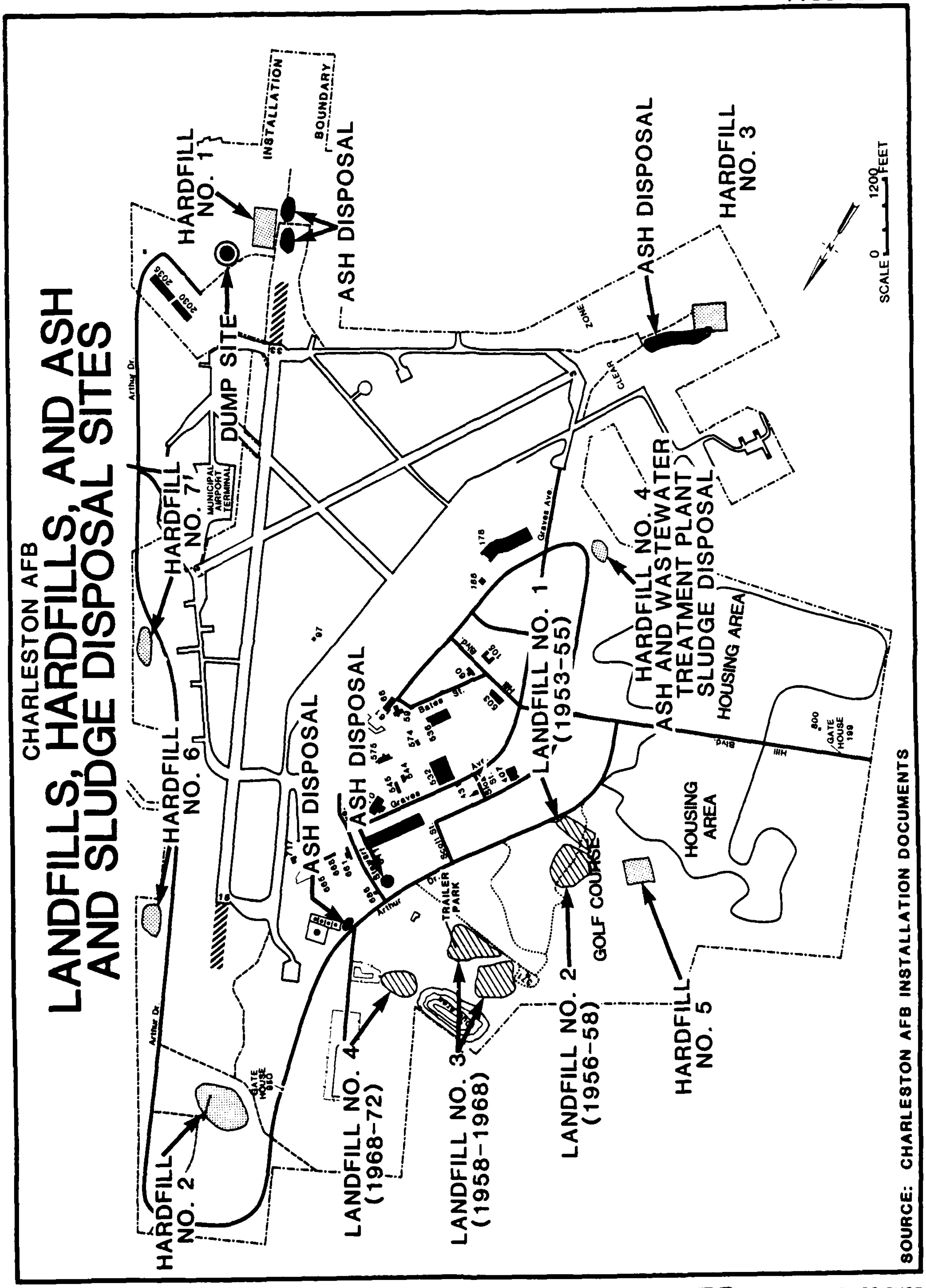
Landfill No. 2 (1956-1958)

Landfill No. 2 is located on the golf course, in the vicinity of the 10th fairway. It is approximately eight acres in size, and was used between 1956 and 1958 for disposal of general refuse and possibly small quantities of industrial waste such as paints, solvents, and batteries. The wastes were placed in 10 feet deep trenches and filled to grade. Daily burning of the refuse took place. The site is closed and has an earth cover with grass. Some exposed waste could be seen in a wooded area, along the south face of the landfill site. During the time the landfill was operational, a trench was excavated slightly north of Landfill No. 2 for the disposal of some unknown material. The site was completely closed afterwards, and a grass cover was provided.

Landfill No. 3 (1959-1968)

Landfill No. 3 is located west of the base trailer park. It is approximately 14 acres in size, and was used between 1959 and 1968 for disposal of general refuse and some industrial wastes from the shop operations. A pesticide storage area was located on the east side of

FIGURE 4.5

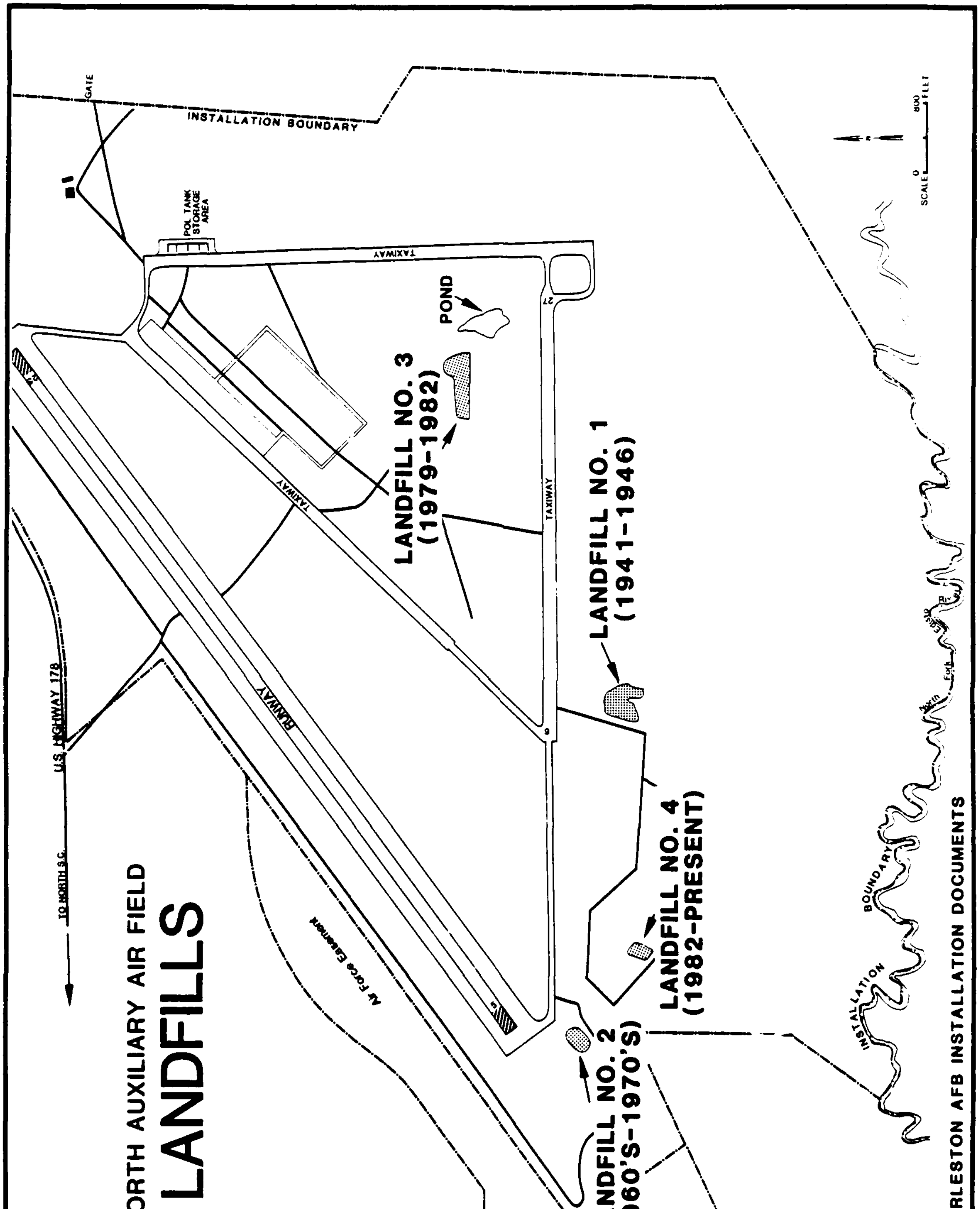


CHARLESTON AFB
LANDFILLS, HARDFILLS, AND ASH AND SLUDGE DISPOSAL SITES
HARDFILL NO. 1
INSTALLATION BOUNDARY
ASH DISPOSAL
DUMP SITE
ASH DISPOSAL
HARDFILL NO. 3
HARDFILL NO. 7
MUNICIPAL AIRPORT TERMINAL
CLEAR ZONE
HARDFILL NO. 6
ASH DISPOSAL
ASH DISPOSAL
HARDFILL NO. 4
ASH AND WASTEWATER TREATMENT PLANT SLUDGE DISPOSAL
HOUSING AREA
LANDFILL NO. 1 (1953-55)
HARDFILL
HOUSING AREA
TRAILER PARK
GOLF COURSE
HARDFILL NO. 2
LANDFILL NO. 4 (1968-72)
LANDFILL NO. 3 (1958-1968)
LANDFILL NO. 2 (1956-58)
HARDFILL NO. 5
Arthur Dr.
Graves Ave.
Bates St.
Scott St.
GATE HOUSE
SCALE 0 1200 FEET
N
SOURCE: CHARLESTON AFB INSTALLATION DOCUMENTS

TABLE 4.2
SUMMARY OF LANDFILL DISPOSAL SITES

Landfill	Operation Period	Approximate Size (acres)	Approximate Depth (feet)	Type of Waste	Estimated Waste Quantity (cu yd)	Method of Operation	Closure Status	Surface Drainage
Landfill No. 1	1953-1955	4	10	General refuse. Possible small quantities of hazardous materials (e.g., paint, solvents, batteries)	40,000	Trench and fill to grade. No burning. Some daily cover.	Closed and covered. Under present golf course.	To Ashley River via Popperdam Creek.
Landfill No. 2	1956-1958	8	10	General refuse. Possible small quantities of hazardous materials (e.g., paint, solvents, batteries)	70,000	Trench and fill to grade. Daily burning and earth cover.	Closed and covered. Under present golf course.	To Ashley River via Popperdam Creek.
Landfill No. 3	1959-1968	14	10	General refuse. Possible moderate quantities of hazardous materials (e.g., paint, solvents, batteries)	120,000	Filled in borrow pit. Some trench and fill. Burning on west side.	Closed and covered. East portion under present garden area.	To Ashley River via Popperdam Creek.
Landfill No. 4	1969-1972	5	10	General refuse. Possible moderate quantities of hazardous materials (e.g., paint, solvents, batteries).	50,000	Trench and fill to grade. No burning.	Closed and covered. Some exposed waste from small excavations into landfill.	Southwest into two small ponds.

FIGURE 4.6



SOURCE: CHARLESTON AFB INSTALLATION DOCUMENTS

the landfill. Leaky malathion drums from the storage area are reported to have been pushed into the landfill. Also on the east side of the landfill, a quantity of unknown material was buried in a dry pit. The site is a filled borrow pit, with some trench and fill procedures used. The depth of the landfill is approximately 10 feet. Burning was conducted on the west of side of the landfill. The site is closed and covered, with the east portion used as a garden area. Soil samples collected on the east portion of the landfill were analyzed for metals using the total digestion method. The analytical tests detected concentrations of nine metals. The data are presented in Appendix E, Table E.3. No comparisons could be made with the EPA Standards because the Standards were developed using a different analytical technique (Leachate Extraction Procedure).

Landfill No. 4 (1969-1972)

Landfill No. 4 is located south of the Small Arms Range. It is approximately five acres in size, and was used between 1969 and 1972 for disposal of general refuse and possibly small amounts of industrial wastes from the shops such as paints, solvents, and batteries. It is probable that industrial waste was disposed at this landfill site since Fire Protection Training Area No. 3 was brought into use in 1970 and primarily burned JP-4 fuel and DPDO was only disposing of reusable materials during this period. The wastes were placed in 10 feet deep trenches and filled to grade. No burning was conducted. The landfill is closed with approximately one foot of cover. During the site visit, several small excavations into the landfill were seen; however, no exposed refuse was observed. Landfill material dug from the excavations was left uncovered beside the holes. The excavations were less than 2 feet in depth. Leachate was observed in a cut west of the site.

Landfills, North Auxiliary Air Field

Four landfill sites were identified at North Auxiliary Air Field, as shown on Figure 4.6. From interviews with North Auxiliary Air Field personnel and an assessment of past air field activities, all four sites were used for disposal of general refuse only. It is unlikely that any hazardous industrial wastes were disposed of at these sites, due to the limited maintenance activity which occurred at the facility.

Hardfills

Seven hardfill areas were identified at Charleston Air Force Base, as identified in Figure 4.5. The majority of the hardfill sites (Site Nos. 2, 4, 5, 6 and 7) were operated in the 1950's and received primarily construction rubble (i.e., concrete, bricks, wood and scrap metal) and landscaping wastes. Hardfill sites Nos. 1, 3 and 4 are suspected to have received material other than construction rubble, and hence, are discussed below.

Hardfill Area No. 1

Hardfill Area No. 1 is located on the east side of the base, in the Runway 33 clear zone. The site was used for disposal of construction debris, empty cans, and buckets. Coal ash disposal area is nearby. The site is open, and debris is visible on the surface. It was evident that uncontrolled dumping occurred in this area and it is possible some industrial waste may have been comingled with the hardfill material. This site was operated primarily in the 1950's but was still receiving small quantities of hardfill in the mid 1970's.

Hardfill Area No. 3

Hardfill Area No. 3 is located in the approach zone of Runway 03. The area was used for disposal of concrete, used office furniture, empty drums and cans, scrap wood and coal ash. Disposal of solvents and other industrial shop wastes may have occurred in connection with activities at Fire Protection Training Area No. 1. Solvents which would not easily burn may have been disposed of at the hardfill. The area is covered over, but some exposed cans and debris are evident. This site was operated in the 1950's and early 1960's.

Hardfill Area No. 4

Hardfill Area No. 4 is located south of Davis Drive, west of Building 175. The site was used for disposal of construction rubble, coal ash, and sludge from the waste water treatment facility. The area is presently closed and covered. This site was operated during the 1950 to the early 1970 period.

Dump Site

One 100 foot by 50 foot dump site was identified on Charleston AFB, and is located south of the TAC Alert Area. Contaminated oil filters, absorbent booms, and paint debris have been dumped down an embankment by the road. Refer to Figure 4.5 for the location of the dump site.

Ash Disposal Areas (1952-1973)

From 1952 until January of 1973, the Heating Plant used coal to fire its boilers. During this operation coal ash would be generated, and disposal was necessary. Six locations on Charleston AFB have been used for coal ash disposal, as denoted on Figure 4.5. Since 1973, the Heating Plant has used fuel oil.

Sanitary Waste Treatment Facility

Charleston AFB operated a primary sanitary waste treatment system until mid-1973. The facility was designed for a flow of 1.5 MGD, and received an average flow of 0.75 MGD. The facility was located north of Hill Boulevard, near the Gate House Building No. 199. The effluent from the treatment plant discharged to the Ashley River. Hardfill Area No. 4 was identified as a location for sludge disposal. The sludge is not considered to be a hazardous waste. Since July 1973, sewage from Charleston AFB has been pumped to the North Charleston sewage treatment plant for treatment.

A package treatment system was installed in 1972 to serve the TAC Alert Area. It was designed for a 5000 gallon per day flow. The unit provides secondary treatment and generated small quantities of sludge. The system has not been in use since the middle 1970's.

Storm Drainage System

The storm drainage system on Charleston AFB consists of 12-, 18- and 36-inch diameter pipes as well as concrete-lined open ditches which drain toward tributaries of the Ashley and Cooper Rivers. On occasion spills have occurred within the storm drainage system. These spills have reportedly included solvents, fuels and dyes. One such spill in the early 1960's caught fire within the drainage ditch between Building 407 and the Base Golf Course. Oil/water separators have been installed at numerous locations throughout the base to prevent the entry of oils to the storm drainage system. A list of the oil/water separators on Charleston AFB is provided in Table E.4, Appendix E.

Incineration

An incinerator is used by Fleet Service to burn overseas, inflight trash to comply with U.S. Department of Agriculture requirements. An inspection late in 1982, showed the incinerator and its standby to be in compliance with South Carolina Air Pollution Regulations and Standards. No potential for environmental concern exists as a result of operating the incinerator.

EVALUATION OF PAST DISPOSAL ACTIVITIES AND FACILITIES

The review of past operation and maintenance functions and past waste management practices at Charleston AFB has resulted in the identification of sites which were initially considered to have a potential for contamination and a potential for contaminant migration. These sites were evaluated using the Decision Tree Methodology referred to in Figure 1.1. Those sites which were considered as not having a potential for contamination were deleted from further consideration. Those sites which were considered as having a potential for the occurrence of contamination and migration of contaminants were further evaluated using the Hazard Assessment Rating Methodology (HARM). Table 4.3 identifies the decision tree logic used for each of the areas of initial concern.

Based on the decision tree logic, 17 of the 40 sites originally reviewed were not considered to warrant evaluation using the Hazard Assessment Rating Methodology. The rationale for omitting these seventeen sites from HARM evaluation is discussed as follows in the following paragraphs.

Hardfill Areas No. 2 and No. 5 through No. 7 received mainly construction rubble (i.e., scrap wood, concrete, metal and bricks) and landscape debris. These materials are typically inert or non-putrescible and hence, would not cause any contamination to the soils or ground water. Hardfill No. 4 received coal ash from the heating plant and waste water treatment plant sludge, but did not receive any hazardous waste materials.

The PCB Transformer leak at Building No. 503 was deleted from the HARM scoring because only a small amount of the substance has leaked and was completely contained. Since the transformer rests on a concrete slab and is closely monitored by base personnel, the potential for contamination and contaminant migration is low. The site has a potential for environmental concern, until the plans for replacement of the transformer are completed.

TABLE 4.3

SUMMARY OF DECISION TREE LOGIC FOR AREAS OF INITIAL ENVIRONMENTAL CONCERN AT CHARLESTON AFB

Site Description	Potential for Contamination	Potential for Contaminant Migration	Potential for Other Environment Concern	HARM Rating
Landfill No. 1	Yes	Yes	NA	Yes
Landfill No. 2	Yes	Yes	NA	Yes
Landfill No. 3	Yes	Yes	NA	Yes
Landfill No. 4	Yes	Yes	NA	Yes
Dump Site	Yes	Yes	NA	Yes
Fire Protection Training Area No. 1	Yes	Yes	NA	Yes
Fire Protection Training Area No. 2	Yes	Yes	NA	Yes
Fire Protection Training Area No. 3	Yes	Yes	NA	Yes
Hardfill Area No. 1	Yes	Yes	NA	Yes
Hardfill Area No. 2	No	No	No	No
Hardfill Area No. 3	Yes	Yes	NA	Yes
Hardfill Area No. 4	No	No	No	No
Hardfill Area No. 5	No	No	No	No
Hardfill Area No. 6	No	No	No	No
Hardfill Area No. 7	No	No	No	No
Fire Demonstration Area No. 1	Yes	Yes	NA	Yes
Fire Demonstration Area No. 2	Yes	Yes	NA	Yes
Base Gasoline Station Leak Site	Yes	Yes	NA	Yes
North PCB Spill Site	Yes	No	NA	Yes
South PCB Spill Site	Yes	No	NA	Yes
PCB Transformer Leak Site	No	No	Yes	No
Hazardous Waste Storage Area No. 1	Yes	Yes	NA	Yes
Hazardous Waste Storage Area No. 2	Yes	Yes	NA	Yes
Salvage Material Storage Yard	Yes	Yes	NA	Yes
Base Fuel Tank Farm	No	No	No	No
Defense Fuel Support Point Tank Farm	Yes	Yes	NA	Yes
Entomology Shop (present)	Yes	Yes	Yes	Yes
Entomology Shop (past)	Yes	Yes	NA	Yes
JP-4 Fuel Line Leak (1976)	No	No	No	No
Underground Fuel Line Leak (1983)	Yes	Yes	Yes	No
Materials Storage Area	Yes	Yes	NA	Yes
Fire Protection Training Area, North Auxiliary Air Field	Yes	Yes	NA	Yes
POL Tank Storage Area, North Auxiliary Air Field	No	No	No	No
Landfill No. 1, North Auxiliary Air Field	No	No	No	No
Landfill No. 2, North Auxiliary Air Field	No	No	No	No
Landfill No. 3, North Auxiliary Air Field	No	No	No	No
Landfill No. 4, North Auxiliary Air Field	No	No	No	No
PD-680 Solvent Spill (1978)	No	No	No	No
JP-4 Spill (mid 1970's)	No	No	No	No
JP-4 Spill (1980-1981)	No	No	No	No

The various fuel and solvent spills and leaks on base were considered to have been either cleaned up or washed away in ditches to the extent that the potential for contaminant migration is low.

At North Auxiliary Air Field maintenance activities, and hence the generation of hazardous wastes, have been limited over the years. Landfills there received only base refuse and construction rubble. The landfills are not considered to be contaminated.

The POL Tank Storage Area at North Field was only used temporarily and there were no reports of spills or leaks; hence the area is not considered to be contaminated.

The remaining 23 sites identified on Table 4.3 were evaluated using the Hazardous Assessment Rating Methodology. The HARM process takes into account characteristics of potential receptors, waste characteristics, pathways for migration, and specific characteristics of the site related to waste management practices. The details of the rating procedures are presented in Appendix H. Results of the assessment for the sites are summarized in Table 4.4. The HARM system is designed to indicate the relative need for follow-on action. The information presented in Table 4.4 is intended as a management tool to assign priorities for further evaluation of the Charleston AFB disposal areas (Chapter 5, Conclusions and Chapter 6, Recommendations). The rating forms for the individual waste disposal sites at Charleston AFB are presented in Appendix I. Photographs of some of the key disposal sites are included in Appendix G.

TABLE 4.4
SUMMARY OF HARM SCORES FOR POTENTIAL CONTAMINATION SOURCES

Rank	Site Name	Receptor Subscore	Waste Characteristics Subscore	Pathways Subscore	Waste Management Factor	Overall Total Score
1	Defense Fuel Support Point Tank Farm	70	80	100	0.95	79
2	Landfill No. 4	61	72	81	1.0	71
3	Fire Protection Training Area No. 3	62	64	80	1.0	69
4	Landfill No. 1	52	72	81	1.0	68
5	Fire Protection Training Area No. 1	54	80	69	1.0	68
6	Landfill No. 3	56	77	74	1.0	67
7	Entomology Shop (past)	58	72	69	1.0	66
8	Dump Site	54	60	81	1.0	65
9	Fire Protection Training Area No. 2	52	80	61	1.0	64
10	Fire Protection Training Area, North Auxiliary Air Field	82	48	61	1.0	64
11	Hardfill Area No. 3	51	60	81	1.0	64
12	Hardfill Area No. 1	54	45	81	1.0	60
13	Base Gasoline Station Leak Site	52	48	81	1.0	60
14	Hazardous Waste Storage Area No. 2	58	54	69	1.0	60
15	Salvage Material Storage Yard	58	60	61	1.0	60
16	Entomology Shop (present)	58	54	67	1.0	60
17	Landfill No. 2	52	45	81	1.0	59
18	Hazardous Waste Storage Area No. 1	58	54	61	1.0	58
19	Fire Demonstration Area No. 2	52	48	61	1.0	54
20	Fire Demonstration Area No. 1	51	48	61	1.0	53
21	Materials Storage Area	52	32	61	1.0	48
22	North PCB Spill Site	52	60	69	0.10	6
23	South PCB Spill Site	61	60	69	0.10	6

CHAPTER 5

CONCLUSIONS

The goal of the IRP Phase I study is to identify sites where there is the potential for environmental contamination resulting from past waste disposal practices and to assess the probability of contaminant migration from these sites. The conclusions given below are based on the assessment of the information collected from the project team's field inspection, review of records and files, review of the environmental setting, and interviews with base personnel, past employees and state and local government employees. Table 5.1 contains a list of the potential contamination sources identified at Charleston AFB and a summary of HARM scores for those sites.

DEFENSE FUEL SUPPORT POINT TANK FARM SPILL SITE

The Defense Fuel Support Point Tank Farm Spill Site has a high potential for environmental contamination. Approximately sixty thousand gallons of JP-4, spilled in October of 1975, were not recovered and either entered the shallow aquifer or evaporated. Extensive monitoring of the ground water has been conducted on the installation, however, no monitoring wells have been installed off the DOD property. The tank farm is located in an area whose geology is dominated by fine sand interbedded with clayey sand or clay. Ground water is present at a depth of one to 14 feet below ground. The site received a HARM score of 79. The site received a high score because of the large quantity of hazardous material involved and the documented horizontal and vertical migration of contaminants within the shallow aquifer.

LANDFILL NO. 4

Landfill No. 4 has a high potential for environmental contamination. The site was used between 1968 and 1972 for disposal of general refuse and small quantities of industrial wastes generated in the shops.

TABLE 5.1
PRIORITY RANKING OF POTENTIAL CONTAMINATION SOURCES

Rank	Site Name	Date of Operation or Occurrence	Overall Total Score
1	Defense Fuel Supply Point Tank Farm Spill Site	1975	79
2	Landfill No. 4	1968-1972	71
3	Fire Protection Training Area No. 3	1970-present	69
4	Landfill No. 1	1953-1955	68
5	Fire Protection Training Area No. 1	1960-1965	68
6	Landfill No. 3	1958-1968	67
7	Entomology Shop (past)	1962-1982	66
8	Dump Site	present	65
9	Fire Protection Training Area No. 2	1965-1970	64
10	Fire Protection Training Area, North Auxiliary Air Field	present	64
11	Hardfill Area No. 3	1952-1965	64
12	Hardfill Area No. 1	1952-1973	60
13	Base Gasoline Station Leak Site	1983	60
14	Hazardous Waste Storage Area No. 2	1981-present	60
15	Salvage Material Storage Yard	present	60
16	Entomology Shop (present)	1982-present	60
17	Landfill No. 2	1956-1958	59
18	Hazardous Waste Storage Area No. 1	1953-early 1960's	58
19	Fire Demonstration Area No. 2	1963-1966	54
20	Fire Demonstration Area No. 1	1963-1966	53
21	Materials Storage Area	1954-1963	48
22	North PCB Spill Site	1980	6
23	South PCB Spill Site	1983	6

Note: This ranking was performed according to the Hazard Assessment Rating Methodology (HARM) described in Appendix H. Individual site rating forms are in Appendix I.

Trench and fill procedures were used, with trenches approximately ten feet deep. No burning was conducted at this site. The landfill is closed and covered, but there is some exposed waste from several small excavations into the site. Leachate from the landfill was noted. It is likely that hazardous industrial wastes such as paint, solvents, and batteries were disposed of at this landfill site. Surface and subsurface soils in the area consist of fine sand with relatively high permeability. Ground water is usually present at a shallow depth (two to ten feet deep). Landfill No. 4 received a HARM score of 77. The site received a high score because of the large quantity of waste involved, the hazardous characteristics of the waste, and the potential for vertical and horizontal migration in the shallow aquifer.

FIRE PROTECTION TRAINING AREA NO. 3

Fire Protection Training Area No. 3 has a high potential for environmental contamination. It has been in use since 1970. The round pit is constructed with an earth berm and a limestone base. Only JP-4 is reported to have been burned in the training area. Contaminated surface-water runoff from the pit was evident. Surface and subsurface soils underlying the area consist of fine sand and loamy fine sand with relatively high permeability. Clay layers interbedded with the sandy soils may be present, thus decreasing subsurface permeability. Ground water is usually present at a shallow depth (two to ten feet deep). Fire Protection Training Area No. 3 received HARM score of 69. The site received a high score because of the hazardous characteristics of the waste and the potential for surface-water and ground-water contamination.

LANDFILL NO. 1

Landfill No. 1 has a high potential for environmental contamination. The site was used between 1953 and 1955 for disposal of general refuse and possibly small amounts of hazardous material, such as paints, solvents, and batteries from the industrial shops. Trench and fill procedures were used, with trenches constructed approximately ten feet in depth. Some daily cover was provided, but no burning took place. The landfill is closed and covered, and is located under the present golf course. Surface and subsurface soils in the area consist of fine sand and fine sandy loam with relatively high permeability in the southern sections of the landfill. Subsurface clay layers present in the fine sandy loam soils have been disturbed, changing the otherwise relatively low permeability associated with the clays. Ground water is usually present at a shallow depth (two to ten feet deep). Landfill No. 1 received a HARM score of 68. The site received a high score because of the hazardous characteristics of the waste and the potential for horizontal and vertical migration in the shallow aquifer.

FIRE PROTECTION TRAINING AREA NO. 1

Fire Protection Training Area No. 1 has a high potential for environmental contamination. It was used between 1960 and 1965. The round pit was constructed with an earth berm and a crushed limestone base. The pit was at times pre-wet with water to minimize infiltration of fuel prior to the fire, and sprayed with water afterwards to cool. Fuel and other waste flammables from the industrial shops were burned.

Surface and subsurface soils underlying the area are sandy and loamy with varying permeability. Ground water is usually present at a shallow depth (two to ten feet deep). The site received a HARM score of 68. The site received a high score because of the waste characteristics and the potential for surface-water and ground-water contamination.

LANDFILL NO. 3

Landfill No. 3 has a high potential for environmental contamination. The site was used between 1959 and 1968 for disposal of general refuse and small amounts of industrial waste such as paint, solvents, and batteries. Surface soil sampling revealed the presence of relatively high concentrations of metals. The site is mostly a filled borrow pit, with some trench and fill procedures used outside the pit area. The depth of the landfill is approximately ten feet. Burning was conducted on the west side of the landfill. The site is closed and covered, with the east portion used as a garden area. Surface soils in the area consist of fine sand and loamy sands with relatively high permeability. Subsurface clay layers present in the vicinity of the landfill have been disturbed, changing the otherwise relatively low permeability associated with the clays. Ground water is usually present at a shallow depth (two to ten feet deep). Landfill No. 3 received a HARM score of 67. The site received a high score because of the large quantity of waste involved, the hazardous characteristics of some of the industrial waste, and the potential for vertical and horizontal migration in the shallow aquifer.

ENTOMOLOGY SHOP (PAST)

The Entomology Shop (past) has a moderate potential for environmental contamination. The past Entomology Shop, used from 1962 until 1982, was located in Building No. 668. Pesticide residue and container rinse water was discharged to the ground or to a french drain behind to the shop, near the railroad tracks. Equipment and vehicles were washed on the CE wash rack, and the wash water is reported to have drained to the ground. Surface and subsurface soils underlying the area consist of fine sand with relatively high permeability. Ground water is usually present at a shallow depth (two to ten feet deep). The past Entomology Shop received a HARM score of 66. The site received a moderate score because of the hazardous characteristics of the waste and the potential for horizontal and vertical migration in the shallow aquifer.

DUMP SITE

The Dump Site has a moderate potential for environmental contamination. Exposed used oil filters, absorbent booms, and paint debris were observed at this site. Surface and subsurface soils underlying the area consist of loamy fine sand with relatively low permeability. Ground water is usually present at a shallow depth (two to ten feet deep). The Dump Site received a HARM score of 65. The site received a moderate score because of the potential for surface-water and ground-water contamination.

HARDFILL AREA NO. 3

Hardfill Area No. 3 has a moderate potential for environmental contamination. The site was used for disposal of concrete, office furniture, empty drums and cans, scrap wood, and coal ash. Personnel interviewed also indicated solvents and other industrial shop wastes may have been disposed of in this area. The area is covered over, but some exposed cans and debris were evident. Surface and subsurface soils at this site are sandy and loamy with varying permeability. Ground water is usually present at a shallow depth (two to ten feet deep). Hardfill Area No. 3 received a HARM score of 64. The site received a moderate score because of potential for vertical and horizontal migration in the shallow aquifer.

FIRE PROTECTION TRAINING AREA NO. 2

Fire Protection Training Area No. 2 has a moderate potential for environmental contamination. It was used between 1965 and 1970. The round pit was constructed with an earth berm and a crushed limestone base. The soil in the pit was sometimes saturated with water prior to the application of the fuel to minimize infiltration. It was also sprayed with water after the fire to cool down the area. Fuel and other waste flammables from the industrial shops were burned. The tennis court is presently located over this site, thus preventing infiltration and production of leachate. Surface and subsurface soils underlying the area consist of fine sand with relatively high permeability. Ground water is usually present at a shallow depth (two to ten feet). The site received a HARM score of 64. The site received a moderate score because of the hazardous characteristics of the waste.

FIRE PROTECTION TRAINING AREA, NORTH AUXILIARY AIR FIELD

The Fire Protection Training Area at North Field has a low potential for environmental contamination. The primary reason the site was considered to have a low potential for contaminant migration was due to the small quantities of diesel fuel and used oil burned at the site. The area was not modified prior to any fire training. Two wells are located in the immediate vicinity. Surface and subsurface soils in the area are loamy sands with moderate permeability. The water table is approximately 30 feet below ground level. The site received a HARM score of 64. The score was elevated despite the low potential for environmental contamination because the number of receptors in the area is high.

HARDFILL AREA NO. 1

Hardfill Area No. 1 has a moderate potential for environmental contamination. The site was used for disposal of construction debris, empty cans, buckets, with ash disposal nearby. The site is open, and debris is visible on the surface. It is possible that some industrial wastes were disposed of in the area. Surface and subsurface soils in the area consist of loamy fine sand with relatively low permeability. Ground water is usually present at a shallow depth (two to ten feet deep). Hardfill Area No. 1 received a HARM score of 60. The site received a moderate score because of the potential for vertical and horizontal migration in the shallow aquifer.

BASE GASOLINE STATION LEAK SITE

The Base Gasoline Station Leak Site has a moderate potential for environmental contamination. The site is located at the Base Gasoline Station, near Building No. 204. Early in 1983, petroleum product was discovered in a manhole near the Base Gasoline Station. Several hundred gallons was thought to have leaked from underground tanks. Once three underground unleaded gasoline tanks were taken out of service, the problem did not reoccur. Monitoring wells were installed. Surface and subsurface soils underlying the area consist of loamy fine sand with relatively high permeability at the surface but relatively low permeability one foot below the surface. Ground water is usually present at a shallow depth (two to ten feet deep). The Base Gasoline Station Leak Site received a HARM score of 60. The site received a moderate score because of the potential for vertical and horizontal migration in the shallow aquifer.

HAZARDOUS WASTE STORAGE AREA NO. 2

Hazardous Waste Storage Area No. 2 has a moderate potential for environmental concern. Since 1981, it has been the storage site of all hazardous wastes generated on Charleston AFB prior to disposal by DPDO. The area is fenced, and has a gravel base. Storage of wastes is in drums and tanks. Drums are resting on wooden skids or directly on the gravel. Surface and subsurface soils underlying the area consist of fine sand with relatively high permeability. Ground water is usually present at a shallow depth (two to ten feet deep). The site received a HARM score of 60. The site received a moderate score because of the potential for surface-water and ground-water contamination.

SALVAGE MATERIAL STORAGE YARD

The Salvage Material Storage Yard has a moderate potential for environmental contamination. It is a fenced area located adjacent to Hazardous Waste Storage Area No. 2. It is currently used for storage of salvage material, but was used in the past for storage of waste solvent drums when the DPDO was located there as well. Emptying of the drums of solvent was reported to have taken place at the site during the 1950's. Surface and subsurface soils underlying the area consist of fine sand with relatively high permeability. Ground water is usually present at a shallow depth (two to ten feet deep). The Salvage Material Storage yard received a HARM score of 60. The site received a moderate score because of the potential for surface-water and ground-water contamination.

ENTOMOLOGY SHOP (PRESENT)

The present Entomology Shop has a moderate potential for environmental contamination. Since 1982, the shop has been located in Building No. 717. Container wash and waste chemicals drain to an underground storage tank. Equipment washing is performed behind the building, with the wash water draining to the ground. Surface and subsurface soils underlying the area consist of fine sand with relatively high permeability. Ground water is usually present at a shallow depth (two to ten feet deep). The present Entomology Shop received a HARM score of 60. The site received a moderate score because of the potential for surface-water and ground-water contamination.

LANDFILL NO. 2

Landfill No. 2 has a moderate potential for environmental contamination. The site was used between 1956 and 1958 for disposal of general refuse and possibly small amounts of hazardous materials such as paints, solvents, and batteries. Trench and fill procedures were used, with trenches constructed approximately ten feet in depth. Daily burning took place at the landfill. Surface and subsurface soil in the area consist of loamy fine sand and fine sandy loam with relatively high permeability in surface soils but relatively low permeability approximately one foot below ground. Subsurface clay layers have been disturbed, varying the otherwise relatively low permeability associated with the clays. Ground water is usually present at a shallow depth (two to ten feet deep). Landfill No. 2 received a HARM score of 59. The site received a moderate score because of the potential for vertical and horizontal migration in the shallow aquifer.

HAZARDOUS WASTE STORAGE AREA NO. 1

Hazardous Waste Storage Area No. 1 has a moderate potential for environmental contamination. The site was used from 1953 until the early 1960's for storage of paint, oil, and oil transformers. Spills were reported to have occurred. A parking lot now covers the area. Surface and subsurface soils underlying the area consist of loamy fine sand with relatively high permeability in surface soils but relatively low permeability approximately one foot below ground. Clay layers interbedded with the sandy soils may be present, thus decreasing subsurface permeability. Ground water is usually present at a shallow depth (two to ten feet deep). The site received a HARM score of 58. The site received a moderate score because of the potential for vertical and horizontal migration in the shallow aquifer.

FIRE DEMONSTRATION AREAS NO. 1 AND NO. 2

Fire Demonstration Areas No. 1 and No. 2 have low potential for environmental contamination. Both sites were used between 1963 and 1966 for firefighting demonstration during open houses. Six demonstrations were performed at each site.

The surface and subsurface soils underlying Fire Demonstration Area No. 1 consist of fine sand with relatively high permeability. The surface and subsurface soils underlying Fire Demonstration Area No. 2 consist of fine sandy loam with relatively low permeability. Ground water at both sites is usually present at a shallow depth (two to ten feet deep). Fire Demonstration Area No. 2 received a HARM score of 54 and Fire Demonstration Area No. 1 received a HARM score of 53. The sites received low scores because of the small quantity of waste involved.

MATERIALS STORAGE AREA

The Materials Storage Area has a low potential for environmental contamination. The area was used between 1954 and 1963 for outside storage of hazardous materials in drums. Spills from the drums are reported to have occurred. The area is capped with concrete; however, surface and subsurface soils underlying the concrete cap consist of soil with a relatively low permeability. Ground water is usually present at a shallow depth (two to ten feet deep). The Materials Storage Area received a HARM score of 48.

NORTH PCB SPILL SITE

The North PCB Spill Site has a low potential for environmental contamination. The site is located outside Building No. 431, and occurred in 1980 when a PCB transformer was struck by lightning. The spill was contained and cleaned up. Surface and subsurface soils underlying the area consist of fine sand with relatively high permeability in surface soils but relatively low permeability approximately three feet below ground. Clay layers interbedded with the sandy soils decrease the subsurface permeability. Ground water is usually present at a shallow depth (two to ten feet deep). The North PCB Spill site received a HARM score of 6.

SOUTH PCB SPILL SITE

The South PCB Spill Site has a low potential for environmental contamination. The site is located East of Hill Road, near Building No. 800, and occurred in 1983 when a transformer mounted on a pole began leaking. The spill was contained and cleaned up. Surface and subsurface soils underlying the area consist of fine sandy loam with relatively low permeability. Ground water is usually present at a shallow depth (two to ten feet deep). The South PCB Spill Site received a HARM score of 6.

CHAPTER 6

RECOMMENDATIONS

Twenty-three sites were identified at Charleston AFB, the DFSP and North Auxiliary Air Field as having the potential for environmental contamination and have been evaluated using the HARM system. This evaluation assessed their relative potential for environmental contamination and identified those sites where further study and monitoring may be necessary. Of primary concern are those sites with a high potential for environmental contamination that should be investigated in Phase II. Sites of secondary concern are those with moderate potential for environmental contamination. Further investigation at these sites is also recommended. No further monitoring is recommended for those sites with low potential for environmental contamination, unless other data collected indicate a potential problem could exist at one of these sites. All sites have been reviewed with regard to future land use restrictions which may be applicable due to the nature of each site.

PHASE II MONITORING RECOMMENDATIONS

The following recommendations are made to further assess the potential for environmental contamination from waste disposal areas at Charleston AFB, the DFSP and North Auxiliary Air Field. The recommended actions are generally one-time sampling programs to determine if contamination does exist at the site. If contamination is identified, the sampling program may need to be expanded to further define the extent of contamination. Geophysical surveys, consisting of electrical resistivity, electromagnetic and/or magnetometer techniques, are recommended prior to the well installations to attempt to delineate the horizontal and vertical extent of the site as well as any subsurface leachate plumes migrating from the site. Preliminary checks with geophysical techniques on and in the vicinity of the site should be made to determine the effectiveness of geophysics prior to a complete site survey.

Following the geophysical surveys ground-water monitoring wells will be installed and sampled according to the South Carolina DHEC Standards. During the installation readings with an organic vapor analyzer or similar equipment should be made. The ground water at those sites with a high potential for environmental contamination will be monitored with wells consisting of Schedule 40 PVC, screened into the shallow aquifer (approximately 30 feet deep). The ground water at those sites with a moderate potential for environmental contamination will be monitored with steel screens and casing placed through hollow stem augers. If the initial samples indicate contamination, additional wells will be required. The number of wells may be reduced if the geophysical techniques are successful in identifying subsurface leachate plumes. An additional reduction in the number of wells can be accomplished by strategically locating the wells in areas where they may serve as upgradient or downgradient well points for more than one site. The recommended monitoring program for Phase II is summarized in Table 6.1.

1.) The Defense Fuel Supply Point Tank Farm Spill Site has a high potential for environmental contamination and monitoring of this site is recommended. Prior to the installation of ground-water monitoring wells, surface geophysical techniques such as electrical resistivity and/or electromagnetic surveys should be employed. The surveys, if effective, should be used to guide the placement of three ground-water monitoring wells downgradient of the site to characterize the ground-water quality and identify any contaminant migration. Explosimeter readings should be observed while drilling the wells. Samples from the existing wells, new wells, and nearby stream should be analyzed for the parameters listed in Table 6.2, list A.

2.) Landfill No. 4 has a high potential for environmental contamination and monitoring of this site is recommended. Prior to the installation of ground-water monitoring wells surface geophysical techniques such as electrical resistivity, electromagnetic and/or magnetometer surveys should be employed. The surveys, if effective, should be used to guide the placement of one upgradient and three downgradient wells to

TABLE 6.1
RECOMMENDED MONITORING PROGRAM FOR PHASE II
CHARLESTON AFB

Ranking Number	Site Name	Rating Score	Recommended Monitoring	[1] Sample Analyses List	Comments
1	Defense Fuel Supply Point Tank Farm Spill Site	79	Conduct geophysical surveys; install and sample 3 downgradient off-site wells; sample existing wells and nearby stream water and sediment; observe explosimeter readings in wells.	A	Continue monitoring if sampling indicates contamination. Additional wells may be necessary to assess extent of contamination.
2	Landfill No. 4	71	Conduct geophysical surveys; install and sample 1 upgradient and 3 downgradient wells; sample off-base spring water and and sediment in excavation pit.	B	Continue monitoring if sampling indicates contamination. Additional wells may be necessary to assess extent of contamination.
3	Fire Protection Training Area No. 3	69	Conduct geophysical surveys; install and sample 1 upgradient and 3 downgradient wells; sample nearby stream water and and sediment.	C	Continue monitoring if sampling indicates contamination. Additional wells may be necessary to assess extent of contamination.
4	Landfill No. 1	68	Conduct geophysical surveys; install and sample 1 upgradient and 3 downgradient wells; sample water and sediment in golf course stream.	B	Continue monitoring if sampling indicates contamination. Additional wells may be necessary to assess extent of contamination.
5	Fire Protection Training Area No. 1	68	Conduct geophysical surveys; install and sample 1 upgradient and 3 downgradient wells (coordinate well placement with well placement for Hardfill Area No. 3); sample water and sediment in Runway Creek.	C	Continue monitoring if sampling indicates contamination. Additional wells may be necessary to assess extent of contamination.
6	Landfill No. 3	67	Conduct geophysical surveys; install and sample 1 upgradient and 5 downgradient wells; sample stream between landfill and trailer park.	B	Continue monitoring if sampling indicates contamination. Additional wells may be necessary to assess extent of contamination.
7	Entomology Shop (past)	66	Conduct geophysical surveys; install and sample 1 well downgradient of french drain.	D	Install and sample additional wells if initial sample indicates contamination.
8	Dump Site	65	Conduct geophysical surveys; install and sample 2 downgradient wells.	B	Install and sample additional wells if initial sample indicates contamination.
9	Fire Protection Training Area No. 2	64	Conduct geophysical surveys; install and sample 2 downgradient wells.	C	Install and sample additional wells if initial sample indicates contamination.
10	Fire Protection Training Area, North Auxiliary Air Field	64	No monitoring recommended.		

Notes: 1. See Table 6.2 for lists and individual parameters within each list.

TABLE 6.1
(Continued)
RECOMMENDED MONITORING PROGRAM FOR PHASE II
CHARLESTON AFB

Ranking Number	Site Name	Rating Score	Recommended Monitoring	Sample Analyses List[1]	Comments
11	Hardfill Area No. 3	64	Conduct geophysical surveys; install and sample 3 downgradient wells (coordinate well placement with well placement for Fire Protection Training Area No. 1); sample water and sediment in Runway Creek.	B	Install and sample additional wells if initial sample indicates contamination.
12	Hardfill Area No. 1	60	Conduct geophysical surveys; install and sample 6 downgradient wells.	B	Install and sample additional wells if initial sample indicates contamination.
13	Base Gasoline Station Leak Site	60	Conduct geophysical surveys; install and sample 2 downgradient wells (coordinate well placement with existing monitoring wells); observe explosimeter readings in wells. Sample existing wells.	E	Install and sample additional wells if initial sample indicates contamination.
14	Hazardous Waste Storage Area No. 2	60	Conduct geophysical surveys; install and sample 3 downgradient wells (coordinate well placement with well placement for Salvage Material Storage Yard); sample water and sediment from nearby spring.	B	Install and sample additional wells if initial sample indicates contamination.
15	Salvage Material Storage Yard	60	Conduct gecphysical surveys; install and sample 3 downgradient wells (coordinate well placement with well placement for for Hazardous Waste Storage Area No. 2); sample water and sediment from nearby spring (coordinate sampling with sampling for HWS Area No. 2).	B	Install and sample additional wells if initial sample indicates contamination.
16	Entomology Shop (present)	60	Conduct geophysical surveys; install and sample 3 downgradient wells.	D	Install and sample additional wells if initial sample indicates contamination.
17	Landfill No. 2	59	Conduct geophysical surveys; install and sample 3 downgradient wells; sample water and sediment in golf course stream.	B	Install and sample additional wells if initial sample indicates contamination.
18	Hazardous Waste Storage Area No. 1	58	Conduct geophysical surveys; install and sample 3 downgradient wells.	D	Install and sample additional wells if initial sample indicates contamination.

Notes: 1. See Table 6.2 for lists and individual parameters within each list.

TABLE 6.2
RECOMMENDED LIST OF ANALYTICAL PARAMETERS
CHARLESTON AFB

LIST A

pH
Total Dissolved Solids
Oil and Grease
Total Organic Carbon
Volatile Aromatics

LIST B

pH
Total Dissolved Solids
Oil and Grease
Total Organic Carbon
Lead
Chromium
Mercury
Volatile Aromatics
Total Organic Halogens

LIST C

pH
Total Dissolved Solids
Oil and Grease
Total Organic Carbon
Phenolics
Total Organic Halogens

LIST D

pH
2,4,5-TP
Chlordane
DDT and its metabolites
Non-phosphate radical of carbaryl (sevin)
Lindane
Total Organic Halogens

LIST E

pH
Total Dissolved Solids
Oil and Grease
Total Organic Carbon
Tetraethyl Lead
Volatile Aromatics

---

characterize the ground-water quality and identify any contaminant migration. Samples from the wells and nearby spring water and sediment should be analyzed for the parameters listed in Table 6.2, list B.

3.) Fire Protection Training Area No. 3 has a high potential for environmental contamination and monitoring of this site is recommended. Prior to the installation of ground-water monitoring wells surface geophysical techniques such as electrical resistivity and/or electromagnetic surveys should be employed. The surveys, if effective, should be used to guide the placement of one upgradient and three downgradient wells to characterize the ground-water quality and identify any contaminant migration. Samples from the wells and nearby stream water and sediment should be analyzed for the parameters listed in Table 6.2, list C.

4.) Landfill No. 1 has a high potential for environmental contamination and monitoring of this site is recommended. Prior to the installation of ground-water monitoring wells surface geophysical techniques such as electrical resistivity, electromagnetic and/or magnetometer surveys should be employed. The surveys, if effective, should be used to guide the placement of one upgradient and three downgradient wells to characterize the ground-water quality and identify any contaminant migration. Samples from the wells and water and sediment from the Golf Course stream should be analyzed for the parameters listed in Table 6.2, list B.

5.) Fire Protection Training Area No. 1 has a high potential for environmental contamination and monitoring of this site is recommended. Prior to the installation of ground-water monitoring wells surface geophysical techniques such as electrical resistivity and/or electromagnetic surveys should be employed. The surveys, if effective, should be used to guide the placement of one upgradient and three downgradient wells to characterize the ground-water quality and identify any contaminant migration. The well placement should be coordinated with the well placement for wells around Hardfill Area No. 3. Samples from the wells and water and sediment from Runway Creek should be analyzed for the parameters listed in Table 6.2, list C.

6.) Landfill No. 3 has a high potential for environmental contamination and monitoring of this site is recommended. Prior to the installation of ground-water monitoring wells surface geophysical techniques such as electrical resistivity, electromagnetic and/or magnetometer surveys should be employed. The surveys, if effective, should be used to guide the placement of one upgradient and five downgradient wells to characterize the ground-water quality and identify any contaminant migration. Samples from the wells and nearby stream (between landfill and trailer park) water and sediment should be analyzed for the parameters listed in Table 6.2, list B.

7.) The Entomology Shop (past) has a moderate potential for environmental contamination and monitoring of the site is recommended. Prior to the installation of ground-water monitoring wells surface geophysical techniques such as electrical resistivity and/or electromagnetic surveys should be employed. The surveys, if effective, should be used to guide the placement of one downgradient well near the french drain to characterize the ground-water quality and identify any contaminant migration. If initial sampling indicates contamination, additional wells should be installed and sampled. The initial sample should be analyzed for the parameters listed in Table 6.2, list D.

8.) The Dump Site has a moderate potential for environmental contamination and monitoring of the site is recommended. Prior to the installation of ground-water monitoring wells surface geophysical techniques such as electrical resistivity, electromagnetic and/or magnetometer surveys should be employed. The surveys, if effective, should be used to guide the placement of two downgradient wells to characterize the ground-water quality and identify any contaminant migration. If initial sampling indicates contamination, additional wells should be installed and sampled. The initial sample should be analyzed for the parameters listed in Table 6.2, list B.

9.) Fire Protection Training Area No. 2 has a moderate potential for environmental contamination and monitoring of the site is recommended. Prior to the installtion of ground-water monitoring wells surface geophysical techniques such as electrical resistivity and/or electromagnetic surveys should be employed. The surveys, if effective, should be used to guide the placement of two downgradient wells to characterize the ground-water quality and identify any contaminant migration. If initial sampling indicates contamination, additional wells should be installed and sampled. The initial samples should be analyzed for the parameters listed in Table 6.2, list C.

10.) Fire Protection Training Area, North Auxiliary Air Field has a low potential for environmental contamination and no follow-on monitoring at this site is recommended.

11.) Hardfill Area No. 3 has a moderate potential for environmental contamination and monitoring of the site is recommended. Prior to the installation of ground-water monitoring wells surface geophysical techniques such as electrical resistivity, electromagnetic and/or magnetometer surveys should be employed to define the location of the site. The surveys, if effective, should be used to guide the placement of three downgradient wells to characterize the ground-water quality and identify any contaminant migration. Placement of the wells should be coordinated with the well placement around Fire Protection Training Area No. 1. If initial sampling indicates contamination, additional wells should be installed and sampled. The initial samples should be analyzed for the parameters listed in Table 6.2, list B.

12.) Hardfill Area No. 1 has a moderate potential for environmental contamination and monitoring of the site is recommended. Prior to the installation of ground-water monitoring wells surface geophysical techniques such as electrical resistivity, electromagnetic and/or magnetometer surveys should be conducted. The surveys, if effective should be used to guide the placement of three down-gradient wells to characterize the ground-water quality and identify contaminant migration. If initial sampling indicates contamination, additional wells should be installed and sampled. The initial samples should be analyzed for the parameters listed in Table 6.2, list B.

13.) The Base Gasoline Station Leak Site has a moderate potential for environmental contamination and monitoring of the site is recommended. Prior to the installation of ground-water monitoring wells surface geophysical techniques such as electrical resistivity and/or electromagnetic surveys should be employed. The surveys, if effective, should be used to guide the placement of two downgradient wells to characterize the ground-water quality and identify any contaminant migration. The well placement should be coordinated with the existing monitoring wells. If initial sampling indicates contamination, additional wells should be installed and sampled. The initial samples and existing monitoring well samples should be analyzed for the parameters listed in Table 6.2, list E.

14.) Hazardous Waste Storage Area No. 2 has a moderate potential for environmental contamination and monitoring of the site is recommended. Prior to the installation of ground-water monitoring wells surface geophysical techniques such as electrical resistivity and/or electromagnetic surveys should be employed. The surveys, if effective, should be used to guide the placement of three downgradient wells to characterize the ground-water quality and identify any contaminant migration. The well placement should be coordinated with the well placement for the Salvage Material Storage Yard. If the initial samples indicate contamination, additional wells should be installed and sampled. The initial samples and samples from the water and sediment of the nearby spring should be analyzed for the parameters listed in Table 6.2, list B.

15.) The Salvage Material Storage Yard has a moderate potential for environmental contamination and monitoring of the site is recommended. Prior to the installation of ground-water monitoring wells surface geophysical techniques such as electrical resistivity and/or electromagnetic surveys should be employed. The surveys, if effective, should be used to guide the placement of three downgradient wells to characterize the ground-water quality and identify any contaminant migration.

The well placement should be coordinated with the well placement for Hazardous Waste Storage Area No. 2. If initial samples indicate contamination, additional wells should be installed and sampled. The initial samples and samples from the nearby spring water and sediment should be analyzed for the parameters listed in Table 6.2, list B.

16.) The Entomology Shop (present) has a moderate potential for environmental contamination and monitoring of the site is recommended. Prior to the installation of ground-water monitoring wells surface geophysical techniques such as electrical resistivity and/or electromagnetic surveys should be employed. The surveys, if effective, should be used to guide the placement of three downgradient wells to characterize the ground-water quality and identify any contaminant migration. If the initial samples indicate contamination, additional wells should be installed and sampled. The initial samples should be analyzed for the parameters listed in Table 6.2, list D.

17.) Landfill No. 2 has a moderate potential for environmental contamination and monitoring of the site is recommended. Prior to the installation of ground-water monitoring wells surface geophysical techniques such as electrical resistivity, electromagnetic and/or magnetometer surveys should be employed. The surveys, if effective, should be used to guide the placement of three downgradient wells to characterize the ground-water quality and identify any contaminant migration. If initial samples indicate contamination, additional wells should be installed and sampled. The initial samples and water and sediment samples from the Golf Course stream should be analyzed for the parameters listed in Table 6.2, list B.

18.) Hazardous Waste Storage Area No. 1 has a moderate potential for environmental contamination and monitoring of the site is recommended. Prior to the installation of ground-water monitoring wells surface geophysical techniques such as electrical resistivity and/or electromagnetic surveys should be employed. The surveys, if effective, should be used to guide the placement of three downgradient wells to characterize the ground-water quality and identify any contaminant migration. If initial samples indicate contamination, additional wells should be installed and sampled. The initial samples should be analyzed for the parameters listed in Table 6.2, list B.

RECOMMENDED GUIDELINES FOR LAND USE RESTRICTIONS

It is desirable to have land use restrictions for the following reasons: (1) to provide the continued protection of human health, welfare, and the environment; (2) to insure that the migration of potential contaminants is not promoted through improper land uses; (3) to facilitate the compatible development of future USAF facilities; and (4) to allow for identification of property which may be proposed for excess or outlease.

The recommended guidelines for land use restrictions at each of the identified disposal and spill sites at Charleston AFB are presented in Table 6.3. A description of the land use restriction guidelines is presented in Table 6.4. Land use restrictions at sites recommended for Phase II monitoring should be reevaluated upon the completion of the Phase II monitoring program and changes made where appropriate.

TABLE 6.3

RECOMMENDED GUIDELINES FOR FUTURE LAND USE RESTRICTIONS

Site Name	Construction	Excavation	Wells	Agriculture	Silviculture	Water Infiltration	Recreation	Burning	Disposal Operations	Vehicular Traffic	Material Storage	Housing
DFSP	NA	R	R	NA	NA	R	NA	R	R	NA	NA	R
Landfill No. 4	R	R	R	R	R	R	R	R	R	R	R	R
Landfill No. 3	R	R	R	R	R	R	R	R	R	R	R	R
FPT Area No. 3	NR	R	R	R	R	R	R	PU	R	NA	PU	R
Landfill No. 1	R	R	R	R	R	R	PU	R	R	NA	R	R
FPT Area No. 1	NR	R	R	R	R	R	NA	R	R	NA	R	R
Entomology shop (past)	NA	R	R	NA	NA	R	NA	NA	NA	NA	NA	NA
Dump Site	NA	NA	R	NA	PU	R	R	R	R	R	R	R
Hardfill Area No. 3	R	R	R	NA	NA	R	NA	R	R	R	R	R
FPT Area No. 2	NR	R	R	NA	NA	R	PU	R	R	NA	R	R
FPT Area, North Field	NA	NA	PU	NA	NA	R	NA	PU	R	NA	R	R
Hardfill Area No. 1	NA	R	R	NA	NA	R	NA	R	R	NA	R	R
Base Gasoline Station	NR	NR	R	NA	NA	R	NA	R	R	NA	NA	R
HWS Area No. 2	NR	NR	R	NA	NA	R	R	R	PU	NA	PU	R
Salvage Material Storage Yard	NR	NR	R	NA	NA	R	NA	R	R	NA	PU	R
Entomology Shop (present)	NR	NR	R	NA	NA	R	NA	R	R	NA	NA	R
Landfill No. 2	R	R	R	R	R	R	PU	R	R	NA	R	R
HWS Area No. 1	NR	NR	R	NA	NA	R	NA	R	R	NA	NA	R
FD Area No. 2	NR	NR	R	NA	NA	R	NA	R	R	NA	NA	NA
FD Area No. 1	NR	NR	R	NA	NA	R	NA	R	R	NA	NA	NA
Materials Storage Area	NR	NR	R	NA	NA	R	NA	R	R	NA	NA	NA
North PCB Spill Site	NR	NR	R	NA	NA	R	NA	R	R	NA	NA	NA
South PCB Spill Site	NR	NR	R	NA	NA	R	NA	R	R	NA	NA	NA

NOTES: DFSP = Defense Fuel Support Point
FPT = Fire Protection Training
HWS = Hazardous Waste Storage
FD = Fire Demonstration
R = Restriction
PCB = Polychlorinated Biphenyls
NA = Not Applicable
PU = Present Use
NR = No Restriction

TABLE 6.4

DESCRIPTION OF GUIDELINES FOR LAND-USE RESTRICTIONS

Guideline	Description
Construction on the site	Restrict the construction of structures which make permanent (or semi-permanent) and exclusive use of a portion of the site's surface.
Excavation	Restrict the disturbance of the cover or subsurface materials.
Well construction on or near the site	Restrict the placement of any wells (except for monitoring purposes) on or within a reasonably safe distance of the site. This distance will vary from site to site, based on prevailing soil conditions and ground-water flow.
Agricultural use	Restrict the use of the site for agricultural purposes to prevent food chain contamination.
Silvicultural use	Restrict the use of the site for silvicultural uses (root structures could disturb cover or subsurface materials).
Water infiltration	Restrict water run-on, ponding and/or irrigation of the site. Water infiltration could produce contaminated leachate.
Recreational use	Restrict the use of the site for recreational purposes.
Burning or ignition sources	Restrict any and all unnecessary sources of ignition, due to the possible presence of flammable compounds.
Disposal operations	Restrict the use of the site for waste disposal operations, whether above or below ground.
Vehicular traffic	Restrict the passage of unnecessary vehicular traffic on the site due to the presence of explosive material(s) and/or of an unstable surface.
Material storage	Restrict the storage of any and all liquid or solid materials on the site.
Housing on or near the site	Restrict the use of housing structures on or within a reasonably safe distance of the site.

APPENDIX A

BIOGRAPHICAL DATA

Biographical Data

ERNEST J. SCHROEDER

Environmental Engineer
Manager, Solid and Hazardous Waste

Personal Information

Date of Birth: 17 June 1944

Education

B.S. in Civil Engineering, 1966, University of Arkansas, Fayetteville, Arkansas
M.S. in Sanitary Engineering, 1967, University of Arkansas, Fayetteville, Arkansas

Professional Affiliations

Registered Professional Engineer (Arkansas No. 3259, Georgia No. 10618, Texas No. 33556 and Florida No. 0029175)
Water Pollution Control Federation
American Academy of Environmental Engineers

Honorary Affiliations

Chi Epsilon

Experience Record

1967-1976 Union Carbide Technical Center, Engineering Department, South Charleston, West Virginia (1967-1968). Project Engineer. Responsible for environmental protection engineering projects for various organic chemicals and plastics plants. Conducted industrial waste surveys, landfill design, and planning for plant environmental protection programs; evaluated air pollution discharges from new sources; reviewed a wastewater treatment plant design; and participated on a project team to design a new chemical unit.

Union Carbide Corporation, Environmental Protection Department, Texas City, Texas (1969-1975). Project Engineer and Engineering Supervisor. Responsible for various aspects of plant pollution abatement programs, including preparation of state and federal permits for wastewater treatment activities.

9/83

ERNEST J. SCHROEDER (Continued)

Operations Representative on $8 million regional wastewater treatment project and member of design team which made the initial site selection and process evaluation and recommendation. Participated in contract negotiations, process and detailed engineering design, construction of the facilities, preparation of start-up manuals, operator training, and the start-up activities. Designated as Project Engineer after start-up on expansion to original waste treatment unit.

Engineering Supervisor responsible for operation of wastewater treatment facilities including collection system, sampling and monitoring programs, spill control and clean-up, primary waste treatment, wastewater transfer system, biological waste treatment, and waste treatment pilot plants. Developed odor control program which successfully reduced odor emissions and represented Union Carbide at a public hearing on community odor problems.

Led special projects such as an excess loss control program to reduce water pollution losses; sewer segregation program involving coordination and reporting of 38 projects for the separation of contaminated and non-contaminated water; and sludge disposal program to develop long-term sludge disposal alternatives and recover land in present sludge landfill area. Developed improved methods of sampling and continuous monitoring of wastewater.

Union Carbide Corporation, Environmental Protection Project Engineer, Toronto, Ontario, Canada (1975-1976). Responsible for the overall environmental permitting, engineering design, construction and start-up of waste treatment systems associated with a new refinery.

1976-Date Engineering-Science, Inc., Project Manager (1976-1978). Responsible for several industrial wastewater projects including the following: wastewater investigation to characterize sources of waste streams in a chemical plant and to develop methods to reduce the wastes, sludge settling studies to evaluate settling characteristics of activated sludge at a chemical plant, development of a process document for the design and operation of a wastewater treatment facility at a petrochemical complex, wastewater treatment evaluation which included characterization of wastewater, unit process evaluation, inhibition studies, design review, operations review, preparation of operations manual, operator training and providing operating assistance for waste treatment facilities, various biological treatability studies and bench-scale and pilot-scale evaluation of advanced waste treatment

ERNEST J. SCHROEDER (Continued)

technologies such as granular carbon adsorption, multi-media filtration, powdered activated carbon treatment, ion exchange and ozonation.

Project Manager for hazardous waste disposal projects involving waste characterization, development of criteria for disposal of hazardous waste, site investigation, preparation of permits, detailed design, construction of facilities and spill clean-up activities.

Deputy Project Manager for industry-wide pilot plant study of advanced waste treatment in the textile industry. Technologies evaluated included coagulation/clarification, multi-media filtration, granular carbon adsorption, powdered activated carbon treatment, ozonation and dissolved air flotation.

Engineering-Science, Inc., Manager of the Industrial Waste Group in the Atlanta, Georgia office (1978-1980). Responsible for the supervision of industrial waste project managers and project engineers and the management of industrial waste studies conducted in the office. Also directly involved in project management consulting with clients on environmental studies and environment assessment projects, e.g., project manager for several spill control and wastewater treatability projects and for a third-party EIS for a new phosphate mine in Florida.

Engineering-Science, Inc., Manager of Solid and Hazardous Waste Group in the Atlanta, Georgia office (1980-date). Responsible for the supervision of solid and hazardous waste project managers and project engineers and the management of solid and hazardous waste projects in the office. Project activities have included permit and regulatory assistance, environmental audits, waste management program development, delisting partitions, ground-water monitoring, landfill evaluations, landfill closure design, hazardous waste management, waste inventory, waste recovery/recycle evaluation, waste disposalalternative evaluation, transportation evaluation, and spill control and countermeasure planning.

Project Manager for twelve Phase I Installation Restoration Program projects for the U.S. Air Force. The objective of this program is to audit past hazardous waste disposal practices that could result in migration of contaminants and recommend priority sites requiring further investigation. Also conducted environmental audits (air, water and solid

ERNEST J. SCHROEDER (Continued)

waste) at over ten industrial facilities. Project manager for a contamination assessment and hazardous waste site cleanup being conducted for an industrial client as part of a consent degree agreement. Project manager for site investigation and contamination assessment projects at multiply hazardous waste sites in the northeast.

Publications and Presentations

Schroeder, E. J., "Filamentous Activated Sludge Treatment of Nitrogen Deficient Waste," research paper submitted in partial fulfillment of the requirements for MSCE degree, 1967.

Schroeder, E. J. and Loven, A. W., "Activated Carbon Adsorption for Textile Wastewater Pollution Control," Symposium Proceedings: Textile Industry Technology, December 1978, Williamsburg, VA.

Schroeder, E. J., "Summary Report of the BATEA Guidelines (1974) Study for the Textile Industry," North Carolina Section of AWWA/ WPCA, Pinehurst, North Carolina, November 1979.

Mayfield, R. E., Sargent, T. N. and Schroeder, E. J., "Evaluation of BATEA Guidelines (1974) Textiles," U.S. EPA Report, Grant No. R-804329, February 1980.

Storey, W. A. and Schroeder, E. J., "Pilot Plant Evaluation of the 1974 BATEA Guidelines for the Textile Industry," Proceedings of the 35th Industrial Waste Conference, Purdue University, May 1980.

Pope, R. L., and Schroeder, E. J., "Treatment of Textile Wastewaters Using Activated Sludge With Powdered Activated Carbon," U.S. EPA Report, Grant No. R-804329, December 1980.

Schroeder, E. J., "Industrial Solid Waste Management Program to Comply with RCRA," Engineering Short Course Instructor, Auburn University, October 1980.

Schroeder, E. J., "Technical and Economic Impact of RCRA on Industrial Solid Waste Management, Florida Section, American Chemical Society, May 1981.

Schroeder, E. J. and Sargent, T. N., "Hazardous Waste Site Rating Systems," Textile Wastewater Treatment and Air Pollution Control Conference, January 1983.

Biographical Data

H. DAN HARMAN, JR.
Hydrogeologist

Personal Information

Date of Birth: 7 December 1948

Education

B.S., Geology, 1970, University of Tennessee, Knoxville, TN

Professional Affiliations

Registered Professional Geologist (Georgia NO.569)
National Water Well Association (Certified Water Well Driller No. 2664)
Georgia Ground-Water Association

Experience Record

1975-1977 Northwest Florida Water Management District, Havana, Florida. Hydrogeologist. Responsible for borehole geophysical logger operation and log interpretation. Also reviewed permit applications for new water wells.

1977-1978 Dixie Well Boring Company, Inc., LaGrange, Georgia. Hydrogeologist/Well Driller. Responsible for borehole geophysical logger operation and log interpretation. Also conducted earth resistivity surveys in Georgia and Alabama Piedmont Provinces for locations of water-bearing fractures. Additional responsibilities included drilling with mud and air rotary drilling rigs as well as bucket auger rigs.

1978-1980 Law Engineering Testing Company, Inc., Marietta, Georgia. Hydrogeologist. Responsible for ground-water resource evaluations and hydrogeological field operations for government and industrial clients. A major responsibility was as the Mississippi Field Hydrologist during the installation of both fresh and saline water wells for a regional aquifer evaluation related to the possible storage of high level radio-active waste in the Gulf Coast Salt Domes.

1980-1982 Ecology and Environment, Inc., Decatur, Georgia. Hydrogeologist. Responsible for project management of hydrogeological and geophysical investigations at uncontrolled hazardous waste sites. Also prepared Emergency Action Plans and Remedial Approach Plans for U.S. Environmental Protection Agency. Additional

6/83

H. Dan Harman, Jr. (Continued)

responsibilities included use of the MITRE hazardous ranking system to rank sites on the National Superfund List.

1982-1983 NUS Corporation, Tucker, Georgia. Hydrogeologist. Responsible for project management of hydrogeological and geophysical investigations at uncontrolled hazardous waste sites.

1983-Date Engineering-Science, Inc., Atlanta, Georgia. Hydrogeologist. Responsible for hydrogeological evaluations during Phase I Installation Restoration Program projects for the Department of Defense.

Publications and Presentations

"Geophysical Well Logging: An Aid in Georgia Ground-Water Projects," 1977, coauthor: D. Watson, The Georgia Operator, Georgia Water and Pollution Control Association.

"Use of Surface Geophysical Methods Prior to Monitor Well Drilling," 1981. Presented to Fifth Southeastern Ground-Water Conference, Americus, Georgia.

"Cost-Effective Preliminary Leachate Monitoring at an Uncontrolled Hazardous Waste Site," 1982, coauthor: S. Hitchcock. Presented to Third National Conference on Management of Uncontrolled Hazardous Waste Sites, Washington, D.C.

"Application of Geophysical Techniques as a Site Screening Procedure at Hazardous Waste Sites," 1983, coauthor: S. Hitchcock. Proceedings of the Third National Symposion and Exposition on Aquifer Restoration and Ground-Water Monitoring, Columbus, Ohio.

Biographical Data

LAURA E. LOVEN

Chemical Engineer

Personal Information

Date of Birth: 1 November 1960

Education

B. S. Chemical Engineering, 1983, Clemson University, Clemson, South Carolina

Professional Affiliations

American Institute of Chemical Engineers

Work Experience

1980 Engineering-Science, Inc. Engineering Technician. Participated in design of multiple solid waste disposal programs and raw material recovery programs. Reviewed and summarized RCRA regulations.

1981 Lockwood Greene Engineering Company. Engineering Aide. Participated in engineering design and construction of industrial and defense installations by providing specifications and vendor literature. Instrumental in the implementation of master Saudi-Oriented Guide Specifications for Army installation design.

1983 Engineering-Science, Inc. Chemical Engineer. Participated in a project to review records and inspect 20 inactive hazardous waste disposal sites. Prepared work plans and cost estimates for monitoring hazardous waste sites and assessing conceptual remedial alternatives for cleanup of the sites.

Biographical Data

R. E. Mayfield, P.E.

Civil/Environmental Engineer

Education

B.S. Civil Engineering, New Mexico State University, 1976.
M.S.C.E., Sanitary Engineering, New Mexico State University, 1978.

Professional Affiliations, Honors and Awards

Registered Professional Engineer (Georgia, #13254)
Georgia Water Control Association
Water Pollution Control Federation
Chi Epsilon
Tau Beta Pi

Experience Record

1972 - 1973	National Soils Service, Inc., Houston, TX
1978 - Date	Engineering-Science, Inc., Atlanta, GA

Pertinent Experience

Mr. Mayfield has over four years project experience while working for Engineering-Science in liquid and solid waste management and spill control planning for both governmental and industrial clients. His experience includes planning, conducting and managing both investigative and design type projects. Specific management and engineering experience is highlighted below.

- Project engineer for identifying potential chemical spill situations and developing effective spill prevention, control and countermeasures (SPCC) plans for three industrial clients.

- Project Manager for an investigation of an abandoned hazardous waste landfill site. The project was sponsored by an industrial firm which had utilized the site during its active life. Project objectives included definition of site geology, hydrogeology and shydrology. The project resulted in collection of sufficient information for development of a remedial action plan and detailed design of closure procedures. Recommendations were made on the necessary steps to secure the site.

- Project Engineer on an Air Force Phase I IRP project conducted at a base located in the southwestern U. S. Responsibilitites included investigation of closed on-base landfill disposal sites.

- Project Engineer on a hazardous waste management study for a major plastics manufacturing company. Responsibilitites included identification and investigation of a number of operating commercial hazardous waste landfills and incinerators.

R. E. Mayfield, P.E. (Continued)

Recommendations were developed concerning the client's best disposal alternatives based on economic, technical, and regulatory considerations.

- Project Engineer involved in a detailed technical critique of a proposed hazardous waste disposal landfill design. Site soils and hydrologic conditions were examined as well as the proposed civil design. Facility design and site conditions were compared to RCRA 3004 Guidelines as well as regulations issued by several state agencies.

Publications and Presentations

"LFDESIGN; A Computer Model to Design and Cost Disposal Facilities for Fossil Energy Wastes," Summary Review of Fossil Energy Waste Sampling and Characterization Program, Laramie Energy Technology Center, Laramie, Wyoming, August 1982.

"Development of Preliminary Hazardous and Non-Hazardous Wastes Landfill Designs using Computer Methods", D.O.E. RCRA Utility Advisory Task Force Meeting, Atlanta, Georgia, February 1982.

"Study of Solid Waste Management Alternatives for the City of Murray, Kentucky," prepared for Office of Solid Waste Management, U.S. EPA, Region IV, Atlanta, Georgia, October 1979.

"Technical Assistance to the City of Birmingham, Alabama," prepared for Office of Solid Waste Management, U.S. EPA, Region IV, Atlanta, Georgia, October 1980.

"Technical Assistance to the City of Aiken, South Carolina," prepared for Office of Solid Waste Management, U.S. EPA, Region IV, Atlanta, Georgia, December 1980.

"Textile Industry/EPA Technical Study of July 1974 BATEA Effluent Standards," prepared for Industrial Processes Division, Industrial Environmental Research Lab, U.S. EPA, January 1980 (Coauthors, E. J. Schroeder and T. N. Sargent).

"Expansion and Improvement of the STPDESIGN Computer Program System, "M.S. Thesis, New Mexico State University, Las Cruces, New Mexico, 1978.

"State of the Art of Computer Programming in Sewage Treatment Plant Design," A.S.C.E. Conference on Computing in Civil Engineering, Atlanta, Georgia, June 1978 (Coauthors, W. A. Barkely, R. D. Hill, and T. M. Shoemarker).

Biographical Data

MARK I. SPIEGEL

Environmental Scientist

Personal Information

Date of Birth: 11 April 1954

Education

B.S. in Environmental Health Science (Magna cum laude), 1976, University of Georgia, Athens, Georgia
Limnology and Environmental Biology, University of Florida, Gainesville, Florida
MBA Candidate, Marketing, Georgia State University

Professional Affiliations

American Water Resources Association
Technical Association of the Pulp and Paper Industry

Experience Record

1974-1976 U.S. Environmental Protection Agency, Surveillance and Analysis Division. Cooperative Student. On assignment to Air Surveillance Branch, participated in ambient air study in Natchez, Mississippi, and operated unleaded fuel sampling program for Southeast National Air Surveillance Network. For Engineering Branch, participated in NPDES compliance monitoring of industrial facilities throughout the southeast; operation and maintenance studies of municipal waste treatment facilities; and post-impoundment study of West Point Reservoir, West Point, Georgia. Participated in industrial bioassay studies for the Ecological Branch.

1977-Date Engineering-Science. Environmental Scientist. Responsible for the conduct of water and wastewater sampling programs and analyses, quality control, laboratory process evaluations, and evaluation of other environmental assessment data. Conducted leachate extraction studies of sludges produced at a large organic chemicals plant to define nature of sludges according to the Resource Recovery and Conservation Act Guidelines. Involved in laboratory quality assurance program for the analysis of water samples used in a stream modeling project. Conducted a water quality modeling study for Amerada Hess Corporation to determine the assimilative capacity of

Mark I. Spiegel (Continued)

a stream receiving effluent from a southern Mississippi refinery.

Participated in bench-scale industrial treatability studies conducted for the American Textile Manufacturers Institute and Eli Lilly Pharmaceuticals in Mayaguez, Puerto Rico, and in carbon adsorption studies for an American Cyanamid chemical plant and Union Carbide Agricultural Products Division.

Involved in various aspects of several industrial environmental impact assessments including preliminary planning for a comprehensive study for St. Regis Paper Company on a major pulp and paper mill expansion project. Assisted in preparation of third-party EIS for EPA and Mobil Chemical Company concerning a proposed 16,000-acre phosphate mining and beneficiation facility. Developed an EIA prior to construction of a pulp and paper complex by the Weyerhaeuser Company in Columbus, Mississippi, which included preparation of a separate document for the Interstate Commerce Commission concerning the construction of a railroad spur to serve the complex. Also involved in formulating the water quality, water resource and socio-economic aspects of an environmental impact assessment for International Paper Company. Participated in large scale site evaluation to determine the suitability and environmental permitting requirements of a site for an east coast brewery for the Adolph Coors Company. Participated in a study to evaluate various options for developing a large parcel of land in the coastal section of North Carolina. The study involved evaluating both the market potential and environmental constraints of various options for development such as timber harvesting, peat mining, corporate farming and aquaculture (catfish farming).

Project Manager. Conducted comprehensive process evaluation of an 80 mgd wastewater treatment system for Weyerhaeuser Company. Responsible for a study to determine the leaching characteristics of sludges for a paint manufacturing facility for RCRA compliance. Also managed study for development of a solid waste management plan for a ceramic pottery manufacturer in northern Alabama which included evaluating surface and ground-water contamination potential from the existing disposal site and assisting manufacturer in developing a disposal program acceptable to state agencies.

Mark I. Spiegel (Continued)

Participated as project team member for Phase I Installation Restoration Program projects for the Department of Defense. Studies were conducted at twelve Air Force bases to identify past hazardous waste disposal practices that could result in migration of contaminants and to recommend priority sites requiring further investigation.

Developed an Environmental Audit Manual for a pharmaceutical company. The purpose of the audit manual was to aid the company in identifying areas where a particular facility may not comply with Federal and state environmental regulations.

6/83

APPENDIX B

LIST OF INTERVIEWEES AND OUTSIDE AGENCY CONTACTS

APPENDIX B

LIST OF INTERVIEWEES

	Position	Period of Service
1.	Woodworker, Recouperage (former Aerial Delivery, 1975-1979), APS	1975-present
2.	PMEL Employee, AMS	1955-present
3.	Entomology Specialist, Entomology Shop, CES	1971-present
4.	Superintendent of Sanitation Department, CES	1970-present
5.	Superintendent of Interior Electric (former Tire Shop, 1967-1968; Environmental Systems, 1968-1970; AGE, 1970-1973), CES	1967-present
6.	Mechanic, Golf Course Maintenance, CES	1979-present
7.	Greenskeeper, Golf Course Maintenance, CES	1979-present
8.	Plumbing Shop Employee, CES	1977-present
9.	Supervisor, Power Production, CES	1980-present
10.	Supervisor, POL Maintenance Branch, CES	1981-present
11.	Fuels Management Employee, Distribution and Quality Assurance	1976-present
12.	Fuels Management Employee, Distribution and Bulk Storage	1979-present
13.	Mechanical Superintendent (formerly worked at Golf Course Maintenance, Housing Maintenance, and Paint Shop), CES	1972-present
14.	Mechanical Superintendent (formerly worked at Refrigeration and Air Conditioning Shop, 1973-1974; Mechanical Engineering Technician, 1974-1978), CES	1973-present
15.	Foreman, Heating Plant, CES	1981-present
16.	Heating Plant Operator, CES	1974-present
17.	Structural Shop Employee (formerly worked at Fire Department, 1975-1981), CES	1975-present

	Position	Period of Service
18.	Chief of Structural Repairs Shop, CES	1953-present
19.	Foreman, Water and Waste (formerly Sanitation Superintendent, 1980-81), CES	1980-present
20.	Foreman, Paint Shop, CES	1960-present
21.	NCOIC, Dental Clinic, USAF Clinic	1980-present
22.	Medical Lab Civilian Employee, USAF Clinic	1982-present
23.	NCOIC, Medical X-Ray Lab, USAF Clinic	1978-present
24.	Branch Chief, AGE, FMS	1980-present
25.	NCOIC, Repair Shop, FMS	1972-present
26.	Assistant Shop Chief, Engine Test Cell, FMS	1970-present
27.	Assistant Shop Chief, Environmental Systems, FMS	1969-present
28.	Fuel Systems Employee, FMS	1980-present
29.	Chief of Gas Turbine Shop, FMS	1982-present
30.	Chief of Machine Shop, FMS	1959-present
31.	Chief of NDI Shop (formerly worked at Structural Repair), FMS	1967-present
32.	Chief of Corrosion Control Shop (former Contractor), FMS	1965-present
33.	Corrosion Control Shop Civilian Employee, FMS	1955-present
34.	Assistant Shop Chief, Hydraulics Shop, FMS	1963-present
35.	Repair Shop Employee, FMS	1981-present
36.	Chief of Corrosion Control Shop, FMS	1953-present
37.	Electric Shop Civilian Employee, FMS	1960-present
38.	NCOIC, Jet Engine Shop, FMS	1974-present
39.	NCOIC, Welding Shop, FMS	1982-present
40.	NCOIC, Wheel and Tire Shop, FMS	1978-present
41.	NCOIC, Auto Hobby Shop, MWR	1981-present
42.	Inspections Branch Chief, OMS	1981-present

	Position	Period of Service
43.	Support Equipment Shop Employee, OMS	1977-present
44.	Chief of Maintenance, Vehicle Maintenance, Transportation Squadron	1953-present
45.	Mechanic, Vehicle Maintenance, Transportation Squadron	1962-present
46.	Vehicle Maintenance Shop Employee, Transportation Squadron	1983-present
47.	Refueling Maintenance Shop Employee, Transportation Squadron	1968-present
48.	Maintenance Supervisor, Firetruck Maintenance (formerly worked at Power Equipment Shop, 1974-1976; Heavy Equipment Maintenance, 1976-1983), Transportation Squadron	1974-present
49.	Superintendent, Audio Visual Lab, AAVS	1979-present
50.	Aero Club Manager (former Maintenance Controller, 1970-1979)	1970-present
51.	Head of Aircraft Repair Department, Trident Technical College	1982-present
52.	Manager, Base Exchange Service Station	1972-present
53.	87th Fighter Interceptor Squadron Member	1980-present
54.	Chief of GATR Site	1982-present
55.	Pavements and Grounds Employee (North Field, 1955-1960; Shaw AFB, 1960-1973), CES	1955-1973
56.	Electrician, North Field, CES	1954-1960
57.	Caretaker, North Field	1981-1983
58.	Field Training Detachment Member, ATC	1982-present
59.	Base Environmental Engineer, CES	1980-present
60.	Deputy Base Civil Engineer, CES	1968-present
61.	Civil Engineering Design Branch Chief (former Design Engineer, 1964-1965; Mechanical Engineer, 1965-1981), CES	1964-present

	Position	Period of Service
62.	Civil Engineering Planner (former Civilian Civil Engineer, 1943-1946; Equipment Operator, 1953-1954), CES	1943-present
63.	Environmental Coordinator, CES	1977-1979
64.	Real Property Office Estate Employee, CES	1956-1977
65.	Civil Engineering Planning Chief (former Design Engineer, 1957-1958, Planning and Programs, 1959-1978), CES	1957-present
66.	NCOIC, Bioenvironmental Engineering Services, USAF Clinic	1981-present
67.	Defense Property Disposal Office Employee	1978-present
68.	Defense Property Disposal Office Employee	1958-present
69.	Wing Historian	1961-present
70.	Fire Chief (former Fireman)	1955-present
71.	Assistant Fire Chief	1963-present
72.	Base Supply Civilian Employee (former NCOIC, Base Supply)	1952-present
73.	Real Property Office Employee (formerly worked at Base Supply, 1969-1974), CES	1969-present
74.	Wing Safety Employee	1955-1983
75.	Civilian AGE Mechanic (former AGE Shop Chief, 1958-1962, 1971-1972), FMS	1958-present
76.	Civil Engineering Planner (formerly worked at Structural Shop, 1955-1974), CES	1955-present
77.	Superintendent, Pavement and Grounds (former Equipment Operator, 1953-1967; Grounds Foreman, 1967-1975), CES	1957-present
78.	Exterior Electric Shop Employee, CES	1955-present
79.	Interior Electric Shop Civilian Employee, CES	1958-present
80.	Guard, Defense Fuel Support Facility	1950-present

	Position	Period of Service
81.	Defense Fuel Support Point Contractor Superintendent, Continental Service	present
82.	Fuels Management Supervisor, Distribution and Bulk Storage	1981-present

OUTSIDE AGENCY CONTACTS

	Agency	Point of Contact
1.	Charleston County Department of Environmental Health, Charleston, SC; Records Clerk (803) 724-5970	Clara Bias
2.	Charleston Public Works Commission, Charleston, SC; Engineer (803) 723-9411	Richard Bath
3.	City of Charleston Archives, Charleston, SC (803) 722-4407	Gail McCoy
4.	North Charleston Department of Public Works, North Charleston, SC; Director (803) 554-5700	Ross Walker
5.	North Charleston Sewer Department, North Charleston, SC; Director (803) 722-2657	A. Koffman
6.	South Carolina Coastal Council Charleston, SC; Director (803) 792-5808	Rob Micheal
7.	South Carolina Department of Health and Environmental Control, Charleston, SC; District Manager (803) 554-5533	Don Peagler
8.	South Carolina Department of Health and Environmental Control, Charleston, SC; Environmental Quality Manager (803) 554-5533	D. Bracy
9.	South Carolina Department of Health and Environmental Control, Ground Water Protection Division, Columbia, SC; Director (803) 758-5213	Jim Ferguson
10.	South Carolina Department of Health and Environmental Control, Stream and Facility Monitoring Division, Columbia, SC; Environmental Quality Managers (803) 758-5496	Mike Marcus Sally Knowles
11.	South Carolina Department of Health and Environmental Control, Stream and Facility Monitoring Division, Columbia, SC; Director of Water Quality Assessment and Enforcement (803) 758-5496	Russ Sherer
12.	South Carolina Geological Survey Columbia, SC (803) 758-6431	(Publications Clerk)
13.	South Carolina Geological Survey Columbia, SC; Geologist (803) 758-6431	Ralph Willahby
14.	South Carolina Land Resources Conservation Commission, Columbia, SC; Map Clerk (803) 758-2823	Robin Jones

	Agency	Point of Contact
15.	South Carolina Water Resources Commission, Beaufort,SC; Hydrologist (803) 524-1995	Drennan Park
16.	South Carolina Water Resources Commission, Columbia, SC; State Climatologist (803) 758-2514	John Purvis
17.	South Carolina Water Resources Commission, Columbia, SC; Public Information Director (803) 758-2514	Mabel Harrison
18.	South Carolina Water Resource Commission, Columbia, SC; Chief of Geology and Hydrology (803) 758-2514	Camil Ransom
19.	South Carolina Water Resources Commission, Columbia, SC; Chief of Surface Water Division (803) 758-2514	Danny Johnson
20.	South Carolina Wildlife and Marine Resources Department, Columbia, SC; Supervisor, Non-game and Heritage Trust Section (803) 758-0007	Tom Kohlsaat
21.	U.S. Defense Logistics Agency, Washington, D.C. Director of Technical Operations (202) 274-7514	Calvin Martin
22.	U.S. Defense Logistics Agency, Washington, D.C.; Chief of Environmental Quality Division (202) 274-6579	Bill Good
23.	U.S. Defense Logistics Agency, Washington, D.C.; Environmental Protection Specialist (202) 274-6579	Bill Randell
24.	U.S. Department of Agriculture, Soil Conservation Service, Orangeburg, SC; Soil Scientist (803) 534-2732	Robert Holley
25.	U.S. Department of Agriculture, Soil Conservation Service, Walterboro, SC; Soil Scientist (803) 577-4171	Warren Stuck
26.	U.S. Department of Housing and Urban Development Federal Emergency Management Agency, Atlanta, GA; South Carolina Coordinator (404) 881-2391	Ms. Campbell
27.	U.S. Environmental Protection Agency, Region IV, Atlanta, GA; Federal Activities Coordinator, Environmental Assessment Branch (404) 881-3776	Arthur Linton
28.	U.S. Geological Survey, Water Resources Division, Columbia, SC; Hydrologist (803) 765-5966	Al Walcott

APPENDIX C

BASE HISTORY, ORGANIZATIONS AND MISSIONS

APPENDIX C

INSTALLATION HISTORY, ORGANIZATIONS AND MISSIONS

BASE HISTORY

Charleston Air Force Base was first established four days after the attack on Pearl Harbor, when the Army requested use of part of Charleston's Municipal Airport. Charleston Army Air Base was used for defense and training of bomber forces until demobilization in 1946.

In 1952, the Air Force initiated a 25-year agreement with the City of Charleston for the establishment of a troop carrier operation at the base. On March 1, 1955, the 1608th Air Transport Wing was established at Charleston Air Force Base. The 1608th was part of the Eastern Air Force and the Military Air Transport Service.

On January 6, 1966, the 1608th was redesignated the 437th Military Airlift Wing. The entire command was upgraded at that time with the headquarters assuming command status (the Military Airlift Command), and the intermediate headquarters becoming the Twenty-first Air Force.

Charleston Air Force Base continues to be part of the Military Airlift Command, a worldwide network of bases with the primary mission of transporting people and equipment to combat locations. Peacetime operations include resupply missions to American military installations and embassies overseas and humanitarian relief flights to locations affected by natural disasters or crisis situations.

The base is the home of the 437th Military Airlift Wing (MAW), a strategic airlift unit of more than 57 C-141B Starlifters. The 437th is one of two C-141 units on the East Coast with a combat mobility mission of supporting combat forces through parachute deliveries.

North Air Force Auxiliary Field was acquired in fee simple title by the War Department between 1942 and 1944. It was used as an Army Air Corps training base during World War II. In May 1956, Headquarters, TAC, by General Order 36, transferred command control of North Field from 8th Air Force to 9th Air Force. The same order assigned property accountability and reporting responsibility from Donaldson Air Force Base to Shaw Air Force Base. In 1972, a management advisory study conducted by Shaw AFB determined that no written authority had been delegated to the base for administrative and operational control. Headquarters Ninth Air Force Special Order G-72 dated 30 August 1972 assigned administrative and operational control of North Field to the 363 Tactical Reconnaissance Wing. North Field real property accountability, jurisdiction, and control was transferred from HQ TAC to HQ MAC on 1 October 1979 per HQ USAF Directive (Special Order No. 31).

Since World War II, North Field has been used for operational training and exercises. In recent years it has been used by MAC units as a drop zone for aerial delivery training.

ORGANIZATIONS AND MISSIONS

Primary Organization and Mission

The 437th Military Airlift Wing (MAW) is the host unit at Charleston AFB with a primary mission to maintain an immediate airlift capacity to deliver and sustain air and ground combat forces anywhere in the world. Peacetime missions include resupply of American military installations and embassies overseas and humanitarian relief flights to locations affected by natural disasters or crisis situations.

Tenant Organizations and Missions

Charleston AFB is the host to a number of tenant organizations providing services, facilities, and other support to these organizations. The following list identifies the tenant units located at Charleston AFB and their missions.

315 Military Airlift Wing

The 315th MAW (Associate) is an Air Force Reserve unit co-located at Charleston. Its personnel work with the 437th MAW to maintain and fly the 437th Starlifters. The Reserve Wing has a number of subordinate units, including the 31st Aeromedical Evacuation Squadron, the 51st Aerial Port Squadron, the 81st Aerial Port Squadron, the 300 Military Airlift Squadron, the 701 Military Airlift Squadron, and the 707 Military Airlift Squadron.

1968 Communications Squadron

The mission of the Communications Squadron is to provide the AFCS/USAF approved communications-electronics (C-E) services to include AUTOVON and AUTODIN tributary services required to support the missions of the Military Airlift Command (MAC), Charleston AFB, and AFCS.

Detachment 7, 1361st Audiovisual Squadron (AAVS)

The Detachment is responsible for the management of the Base Audiovisual Service Center (ASC). Its mission is to provide audiovisual services in support of the management, housekeeping, information, and operational function of the 437th Military Airlift Wing, 437th Air Base Group, and all tenant units co-located at or receiving support from Charleston Air Force Base. Support is in the form of still photographic, graphic and audiovisual film library services to include activities, events and action of operational, historic or of public information value.

Detachment 6, 1600 Management Engineering Squadron (MACMET)

The mission of MACMET, Charleston, is to provide manpower, organizational, and management engineering services to the 437th Military Airlift Wing.

Detachment 1, 87th Fighter Interceptor Squadron (FIS)

The mission of the Fighter Interceptor Squadron is to identify all unknown aircraft penetrating the air defense identification zone (ADIZ). (In conjunction with this, it follows up with detection, the identification, interception and destruction of hostile aircraft.) In addition, the squadron is responsible for trailing and monitoring hijacked aircraft as well as escorting aircraft in distressed or lost condition.

Detachment 3, 15 Weather Squadron

The mission of the Weather Squadron is to provide environmental staff and operational support services required by supported commander and by other U.S. Government agencies and activities.

Detachment 2103, Office of Special Investigations (OSI)

The mission of this organization is to provide criminal, counterintelligence, internal security and special investigative services.

Field Training Detachment 317 (ATC)

Field Training Detachment 317 was established to provide maintenance training for the 437th Military Airlift Wing (MAW) and the tenant organizations assigned to the 437th MAW. In addition to the 437th MAW, Detachment 317 provides training to Military Airlift Command (MAC), detached units of MAC and transient students enroute to MAC assignments. Training is accomplished through classroom instruction and hands-on training. Hands-on training is attained through the use of Mobile Training Sets (MTS) or operational equipment located at the host organization work center. Field Training Detachment 317 conducts technical, associate, multi-system, Communications/Navigation and On-The-Job Training (OJT) Advisory Service courses.

Area Defense Counsel

Functionally, the Area Defense Counsel acts as defense counsel in courts-martial and Article 32, UCMJ, investigations. This office also provides Article 15, UCMJ, advice, represents respondents before administrative boards, and advises suspects in custodial or interrogation situations.

Air Force Audit Agency (AFAA)

The mission of the AFAA is to provide all levels of Air Force management with an independent, objective, and constructive evaluation of the effectiveness and efficiency with which managerial responsibilities (including financial, operational, and support activities) are carried out.

Armed Forces Courier Station (ARFCOS)

This is a tri-service JCS agency with a joint headquarters located in Washington, D.C. The headquarters is staffed by representatives of the Department of the Army, Department of the Navy, and Department of the Air Force. The mission of the ARFCOS is the secure and expeditious transmission of material requiring protection by military couriers.

Military Air Traffic Coordination Unit

This unit serves as the principal element at the aerial port with liaison between the Aerial Port of Embarkation and the shipper services and agencies in regard to operational matter and insure the orderly flow of military traffic (cargo and mail) into the airlift system.

Army Assistance Office

The mission of this office is to operate as an extension of U.S. Army Military Personnel Center in providing personnel assistance and emergency personnel administration to transient Army personnel and their dependents enroute to or returning from overseas and to monitor and enhance performance of the Personnel Movement system as well as accomplish required diversion of and coordination with transient personnel.

Additional Tenant Units:

Air Force Commissary Services (AFCOMS)

Trident Technical College

APPENDIX D

NORTH AUXILIARY AIR FIELD

ENVIRONMENTAL SETTING

TABLE OF CONTENTS

APPENDIX D NORTH AUXILIARY AIR FIELD ENVIRONMENTAL SETTING

LIST OF FIGURES

LIST OF TABLES

APPENDIX D

NORTH AUXILIARY AIR FIELD

ENVIRONMENTAL SETTING

INTRODUCTION

The environmental setting of the North Auxiliary Air Field is described in this appendix. Environmental features which relate to the movement of potentially hazardous waste contaminants will be emphasized. An environmental setting summary is included at the end of this appendix.

Meteorology

The climate of North Auxiliary Air Field is characterized by warm and humid summers and mild winters. The minimum average daily temperature between 1935 and 1964 was 52.4°F and the maximum average daily temperature for the same period was 76.0°F resulting in a mean annual temperature of 64.2°F at the Orangeburg, S.C. Weather Station (Siple, 1975). Additional data from the Orangeburg Station indicate that the mean annual precipitation for the 29-year period was 46.37 inches. The estimated lake evaporation for North Auxiliary Air Field is 42.5 inches (NOAA, 1977).

The net precipitation for North Auxiliary Air Field is calculated to be plus four inches. The one-year 24-hour rainfall event for the area is estimated to be 3.3 inches (NOAA, 1963).

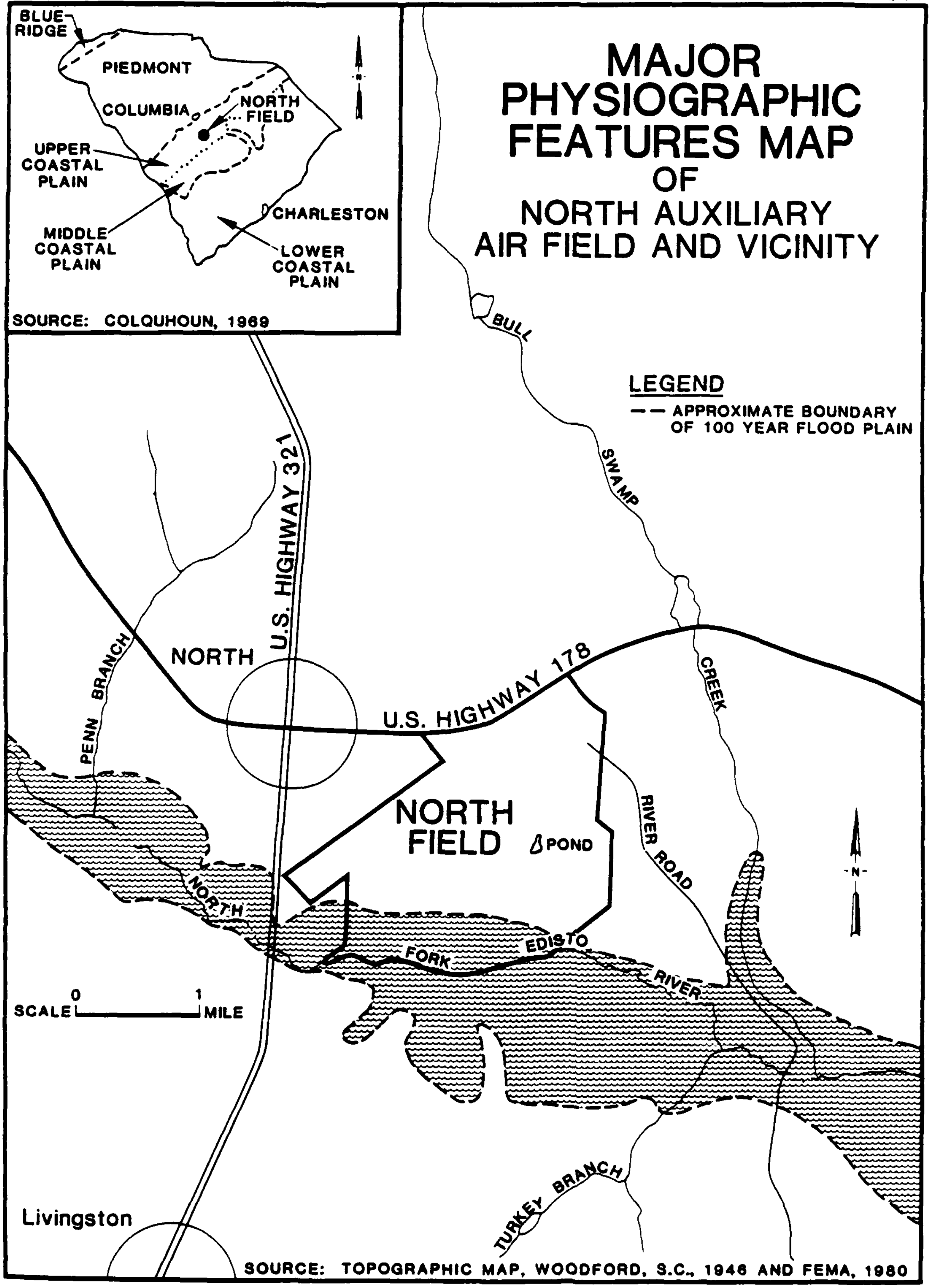
Geography

North Auxiliary Air Field is located on the Aiken Plateau of the Upper Coastal Plain Province (Siple, 1975). The installation itself is located on a broad interstream area between the North Fork Edisto River to the south and Bull Swamp Creek to the northeast (Figure D.1).

Topography

The topography of North Auxiliary Air Field is characterized by low relief. Elevations vary from a high of 340 feet MSL adjacent to Highway 178 on the northern end of the installation to a low of 200 feet MSL in

FIGURE D.1


MAJOR PHYSIOGRAPHIC FEATURES MAP OF NORTH AUXILIARY AIR FIELD AND VICINITY
BLUE RIDGE
PIEDMONT
COLUMBIA
NORTH FIELD
UPPER COASTAL PLAIN
MIDDLE COASTAL PLAIN
CHARLESTON
LOWER COASTAL PLAIN
SOURCE: COLQUHOUN, 1969
LEGEND
APPROXIMATE BOUNDARY OF 100 YEAR FLOOD PLAIN
BULL SWAMP CREEK
U.S. HIGHWAY 321
U.S. HIGHWAY 178
NORTH
PENN BRANCH
NORTH FIELD
POND
RIVER ROAD
NORTH FORK EDISTO RIVER
SCALE 0 1 MILE
TURKEY BRANCH
Livingston
N
SOURCE: TOPOGRAPHIC MAP, WOODFORD, S.C., 1946 AND FEMA, 1980

wetlands adjacent to the North Fork Edisto River on the southern end of the installation. A prominant topographic feature on the installation is a small pond at the eastern end of the east-west trending man-made depression parallel to the south taxiway. Erosional cuts surrounding this pond are narrow and vary between two and six feet deep. Another prominent feature is the large wetland area on the southern end of the installation.

Soils

The Soil Conservation Service of the U.S. Department of Agriculture completed the soil mapping of North Auxiliary Air Field in 1982. Fourteen soil types were identified. Figure D.2 shows the location of these soil types and prime farmland. Table D.1 describes the soils and their engineering properties. The soils are typically loamy sand with pebbles and gravel. The soil permeability at depth (5-80 inches) is generally lower than the surface permeability. The soils are poorly drained and subject to erosion. The landfill use constraints as listed in Table D.1 are defined as follows: "slight - only a few limitations, if any, and these can be easily overcome; moderate - limitations are present and must be recognized, but it is practical to overcome them; severe - limitations are difficult to overcome and, therefore, the suitability of the specified use is questionable," (SCS, 1971).

SURFACE-WATER RESOURCES

North Auxiliary Air Field is located in the Ashley-Combahee-Edisto River Basin northwest of the confluence of the North Fork Edisto River and Bull Swamp Creek. The North Fork Edisto River is the southern boundary of the base meandering approximately 2.5 miles through a wetland flood plain approximately 1.5 miles wide adjacent to the base (Figure D.3). According to the Federal Emergency Management Agency (FEMA) the wetland area is the only area on the base which may be inundated by a 100-year flood event (FEMA, 1980). A 100-year flood has a one percent chance of occurrence in any given year.

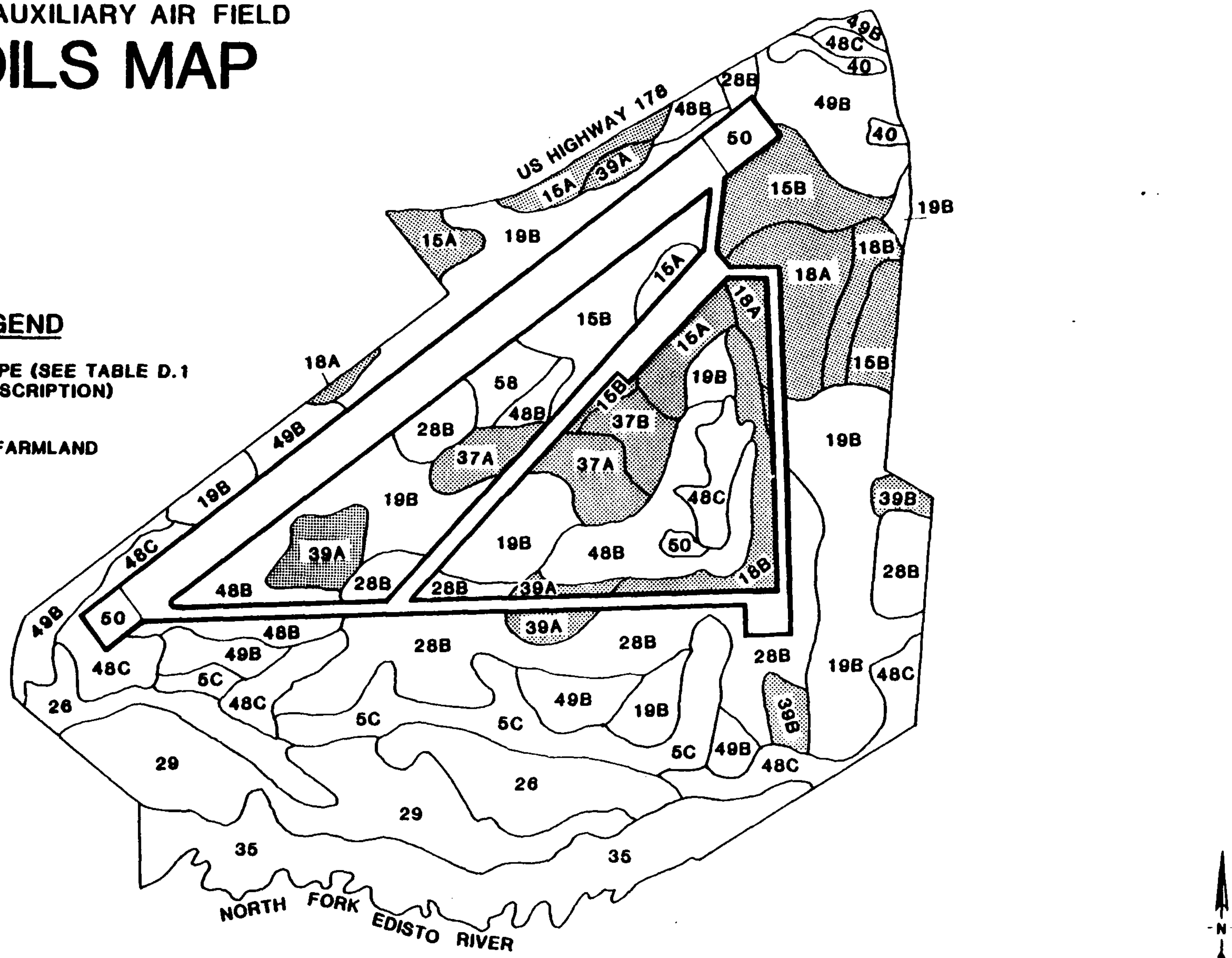
Drainage

Surface-water drainage on North Auxiliary Air Field occurs in eight intermittent streams (Figure D.3). Two streams originate in the extreme northeastern corner of the base and drain eastward to Bull Swamp Creek.

FIGURE D.2

NORTH AUXILIARY AIR FIELD

SOILS MAP



LEGEND

15B SOIL TYPE (SEE TABLE D.1 FOR DESCRIPTION)

PRIME FARMLAND

SOURCE: USDA SOIL CONSERVATION SERVICE, PRELIMINARY MAP, 1982

TABLE D.1
NORTH AUXILIARY AIR FIELD SOILS

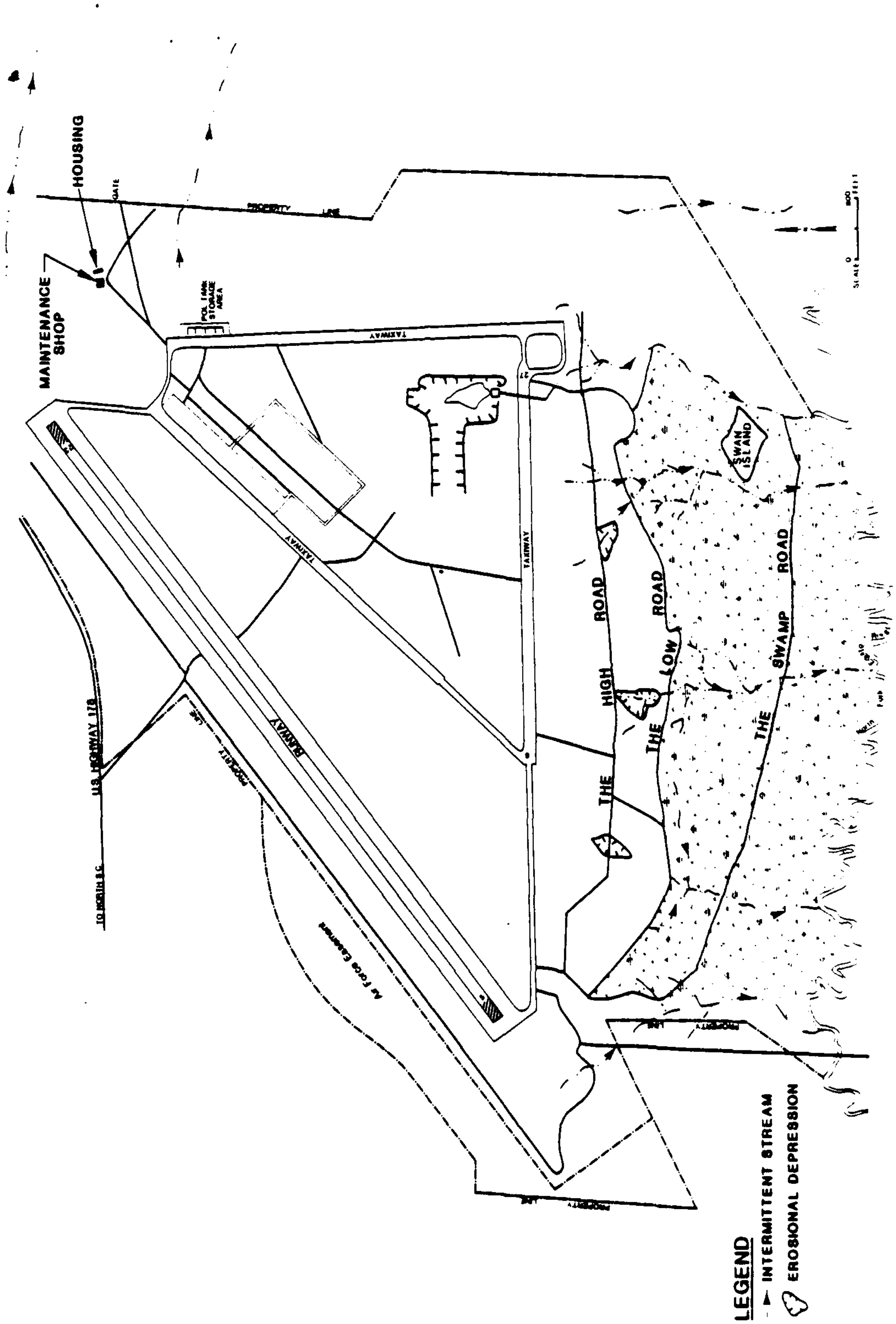
Symbol on Figure D.2	Unit Description	Surface Soil Depth (inches)	Surface Soil Permeability[3] (inches/hour)	Selected Lower Soil Depths Depth (inches)	Selected Lower Soil Depths Permeability[3] (inches/hour)	Landfill Use Limitations
5B	Ailey sand, 2-6% slopes	0-24	6.0-20	36-50	0.06-0.2	Severe-seepage
5C	Ailey sand, 6-10% slopes	0-24	6.0-20	36-50	0.06-0.2	Severe-seepage, slope
[1]15A	Dothan loamy sand, 0-2% slopes	0-13	2.0-6.0	33-60	0.2-0.6	Slight
[1]15B	Dothan loamy sand, 2-6% slopes	0-13	2.0-6.0	33-60	0.2-0.6	Slight
[1]18A	Faceville loamy sand, 0-2% slopes	0-5	6.0-20	11-72	0.6-2.0	Slight
[1]18B	Faceville loamy sand, 2-6% slopes	0-5	6.0-20	11-72	0.6-2.0	Slight
19B	Fuquay sand, 0-6% slopes	0-34	>6.0	45-96	0.06-0.2	Slight
26	Johnston sandy loam	0-30	2.0-6.0	30-60	6.0-20	Severe-flooding, seepage, ponding
28B	Lucy loamy sand	0-24	6.0-20	35-70	0.6-2.0	Severe-seepage
29	Lumbee sandy loam	0-14	2.0-6.0	35-60	6.0-20	Severe-seepage wetness
35	Meggett fine sandy loam	0-8	2.0-6.0	8-52	0.06-0.2	Severe-flooding wetness
[1]37A	Norfolk loamy sand, 0-2% slopes	0-17	6.0-20.0	17-70	0.6-2.0	Slight
[1]37B	Norfolk loamy sand, 2-6% slopes	0-17	6.0-20.0	17-70	0.6-2.0	Slight
[1]39A	Orangeburg loamy sand, 0-2% slopes	0-7	2.0-6.0	12-54	0.6-2.0	Slight
[1]39B	Orangeburg loamy sand, 2-6% slopes	0-7	2.0-6.0	12-54	0.6-2.0	Slight
40	Bibb sand	0-37	0.6-2.0	37-60	0.6-2.0	Severe-flooding, wetness
48B	Neeses loamy sand, 2-6% slopes	0-8	2.0-6.0	28-54	0.06-0.6	Slight
48C	Neeses loamy sand, 6-10% slopes	0-8	2.0-6.0	28-54	0.06-0.6	Moderate-slope
49C	Troup sand	0-53	6.0-20	53-80	0.06-2.0	Severe-seepage
50	[2]Udorthents, loamy	-	0.6-2.0	-	-	-

Notes: 1. Prime Farmland (see Appendix K for definition)
2. Soil unit in which properties vary due to removal of top soil and some subsoil (fill).
3. To convert inches/hour to centimeter/second multiply values shown by 0.0007.

Source: USDA, SCS, 1983

FIGURE D.3

NORTH AUXILIARY AIR FIELD
SURFACE DRAINAGE



SOURCE: NORTH FIELD TACTICAL MAP & SCS SOILS MAP

Six other streams originate just south of the south taxiway and drain southward to the North Fork Edisto River. A small pond located adjacent to the south taxiway was larger than its present size prior to 1979 and the overflow structure and buried culverts under the runway allowed increased drainage during pond overflow conditions. During the base visit (June 1983), two small apparent wet-weather springs were observed draining into the pond. These springs and the lack of vegetation on the south, west and east slopes of the pond area allow erosion and transportation of sediment into the pond.

Surface-Water Quality

The surface streams in the North Auxiliary Air Field vicinity are described as good quality streams. According to the South Carolina Pollution Control Authority, the North Fork Edisto River adjacent to the base is classified as a Class A stream in which water quality is to be maintained at a high level suitable for primary contact sports such as swimming. Bull Swamp Creek adjacent to the base is classified as a Class B stream in which water quality is to be maintained at a lesser quality level suitable for secondary contact sports such as fishing, sources of drinking water after conventional treatment, and industrial and agricultural uses ("ACE", 1972). Surface-water quality data for the North Auxiliary Air Field area is tabulated in Table D.2 and data station locations are shown in Figure D.4.

Surface-Water Use

Surface water in the vicinity of North Auxiliary Air Field is used for recreation and public utilities. The town of North operates a sewage treatment facility on the North Fork Edisto River approximately two miles upstream from North Auxiliary Air Field. The town of Orangeburg, approximately 15 miles downstream, operates a water treatment facility and a sewage treatment facility on the North Fork Edisto River. The water treatment facility has a peak water demand of 5.1 mgd and the sewage treatment facility has an average flow of 1.01 mgd. Ethyl Corporation, also in Orangeburg, pumps 1.5 mgd from the North Fork Edisto River as a water supply and discharges 1.7 mgd into the river after wastewater treatment ("ACE", 1972).

TABLE D.2

SURFACE-WATER QUALITY DATA FOR NORTH AUXILIARY AIR FIELD VICINITY

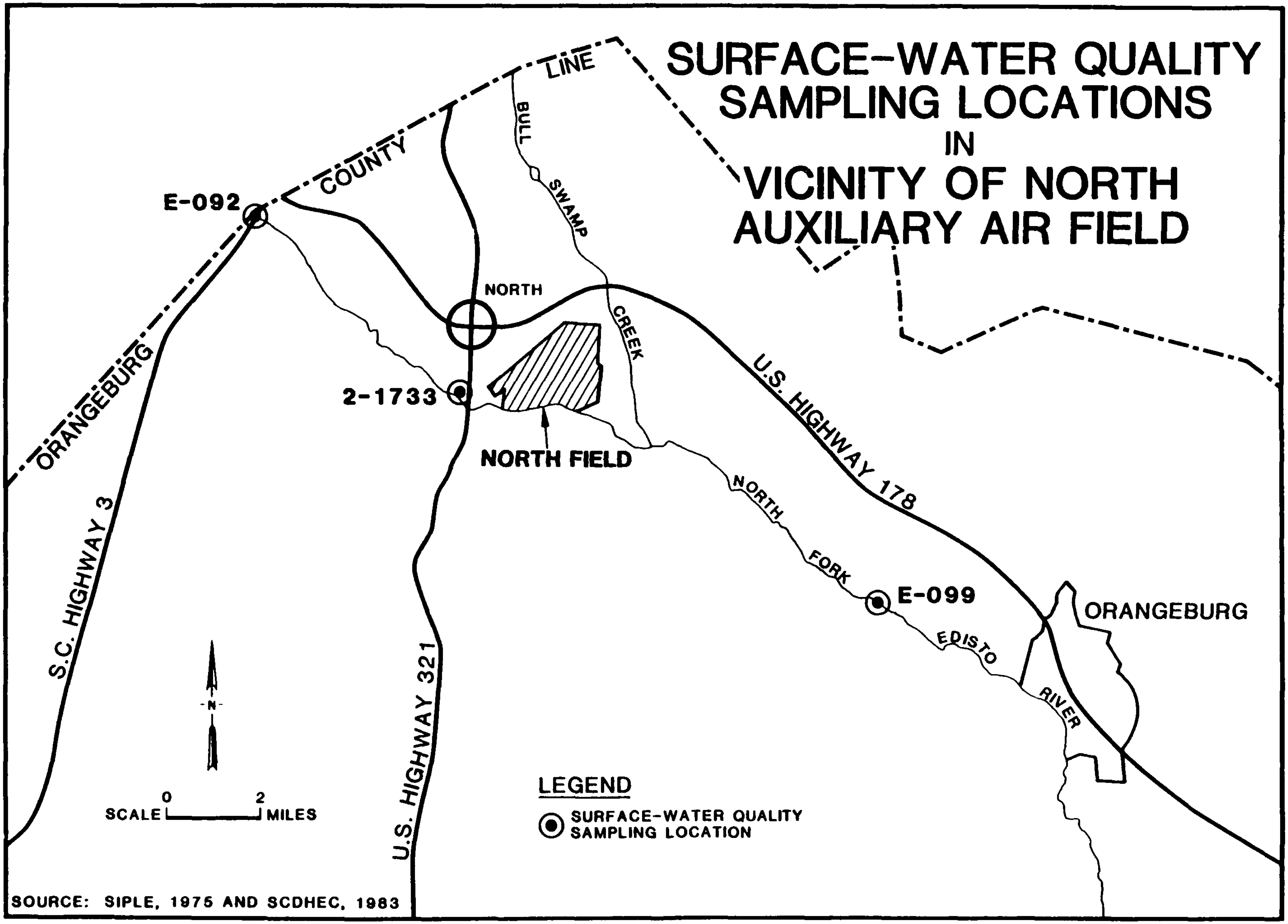
Station Identification (Major Streams)	Date	Selected Parameters							
		pH	Specific Conductance (umhos/cm)	Chloride (mg/l)	Total Iron (ug/l)	Total Chromium (ug/l)	Total Lead (ug/l)	Total Organic Carbon (mg/l)	Lindane (ug/l)
E-092, North Forth Edisto River at SC Highway 3	06/14/82	6.10	NA	NA	NA	NA	NA	6.5	<0.05
	01/24/83	NA	NA	NA	240	<50	<50	NA	NA
2-1733, North Fork Edisto River Near North	06/-/50	6.4	24	3.3	270	NA	NA	NA	NA
E-099, North Fork Edisto River at SC Highway S-38-74 north-west of Orangeburg	01/24/83	5.7	NA	NA	260	<50	<50	5.9	NA

Notes: NA = Not analyzed
See *Figure D.4* for station locations

umhos/cm = micromhos per centimeter
mg/l = milligrams per liter
ug/l = micrograms per liter

Source: SCDHEC, 1982 & 1983; Siple, 1975

FIGURE D.4


SURFACE-WATER QUALITY
SAMPLING LOCATIONS
IN
VICINITY OF NORTH
AUXILIARY AIR FIELD
ORANGEBURG
COUNTY
LINE
E-092
BULL
SWAMP
CREEK
NORTH
2-1733
NORTH FIELD
U.S. HIGHWAY 178
NORTH
FORK
E-099
EDISTO
RIVER
ORANGEBURG
S.C. HIGHWAY 3
U.S. HIGHWAY 321
N
SCALE 0 2 MILES
LEGEND
SURFACE-WATER QUALITY SAMPLING LOCATION
SOURCE: SIPLE, 1975 AND SCDHEC, 1983

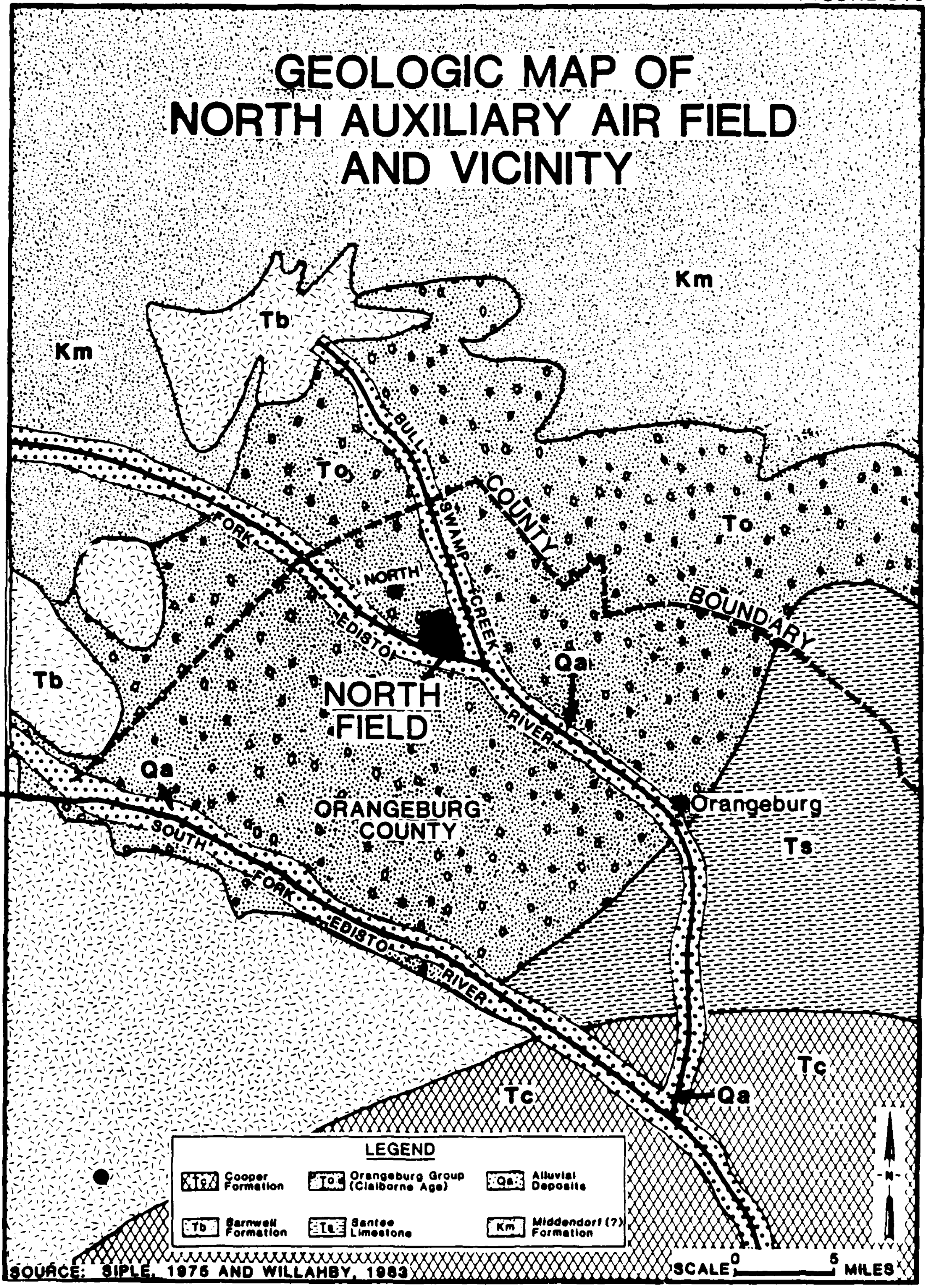
GROUND-WATER RESOURCES

The ground-water resources in the vicinity of North Auxiliary Air Field are relatively abundant with water yields from six-inch diameter wells ranging from 50 to 400 gpm. Water is pumped from wells screened in the sands of the Orangeburg Group. The two wells on North Auxiliary Air Field, numbers OR-36 and OR-46, reportedly yield 150 gpm and 50 pgm, respectively (Siple, 1975).

Hydrogeologic Units

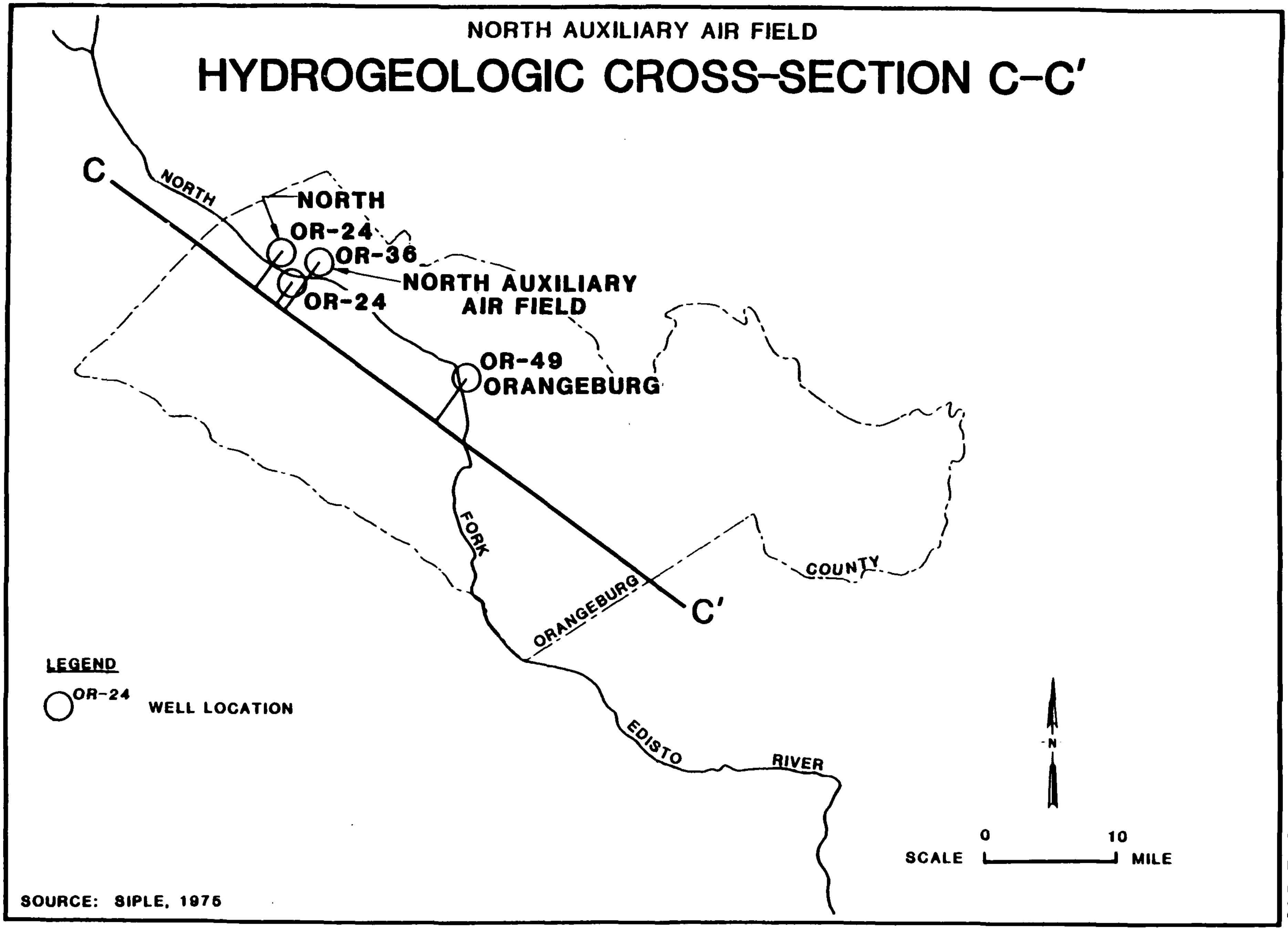
Geologically, North Auxiliary Air Field is located in outcrop areas of the Alluvial deposits and the Orangeburg Group. Both units consist of unconsolidated sediments of sand and clay. During the site visit (June 1983), red sandy clay containing medium-to-coarse grained sand with pebbles was observed outcropping in erosional cuts near the base pond. A hard pan layer of cemented sand approximately six inches thick was also observed approximately five feet below land surface. Figure D.5 shows the aerial extent of the geologic units in the vicinity of North Auxiliary Air Field. Figure D.6 shows the location of hydrogeologic cross section C-C' and Figure D.7 shows the vertical distribution of these units and selected water levels in the subsurface. The lithology and the water-bearing characteristics of each unit are described in Table D.3. Figure D.8 shows the lithology and well construction details of North Auxiliary Air Field well number OR-36.

Hydrologically, North Auxiliary Air Field is located in recharge areas for the flood plain aquifers and the Orangeburg Group aquifers. Recharge occurs as precipitation infiltrates directly into permeable zones of the soil and migrates downward entering the unconfined or water-table aquifer. Leakage of ground water through overlying sediments also contributes ground-water recharge to the underlying confined aquifers at depths of 100 feet or more. The regional direction of ground-water flow within the Orangeburg Group follows the dip or slope of the sediments toward the southeast coastal areas. Natural ground-water discharge from the Orangeburg Group occurs nearby in streams and springs and at a distance in lower formations down dip (Siple, 1975). During the site visit (June 1983), two small wet-weather springs were observed in erosional cuts near the base pond. These springs are indications of possible perched water-table zones which have been reported in Orangeburg County by Siple. Static water levels of



ES ENGINEERING-SCIENCE

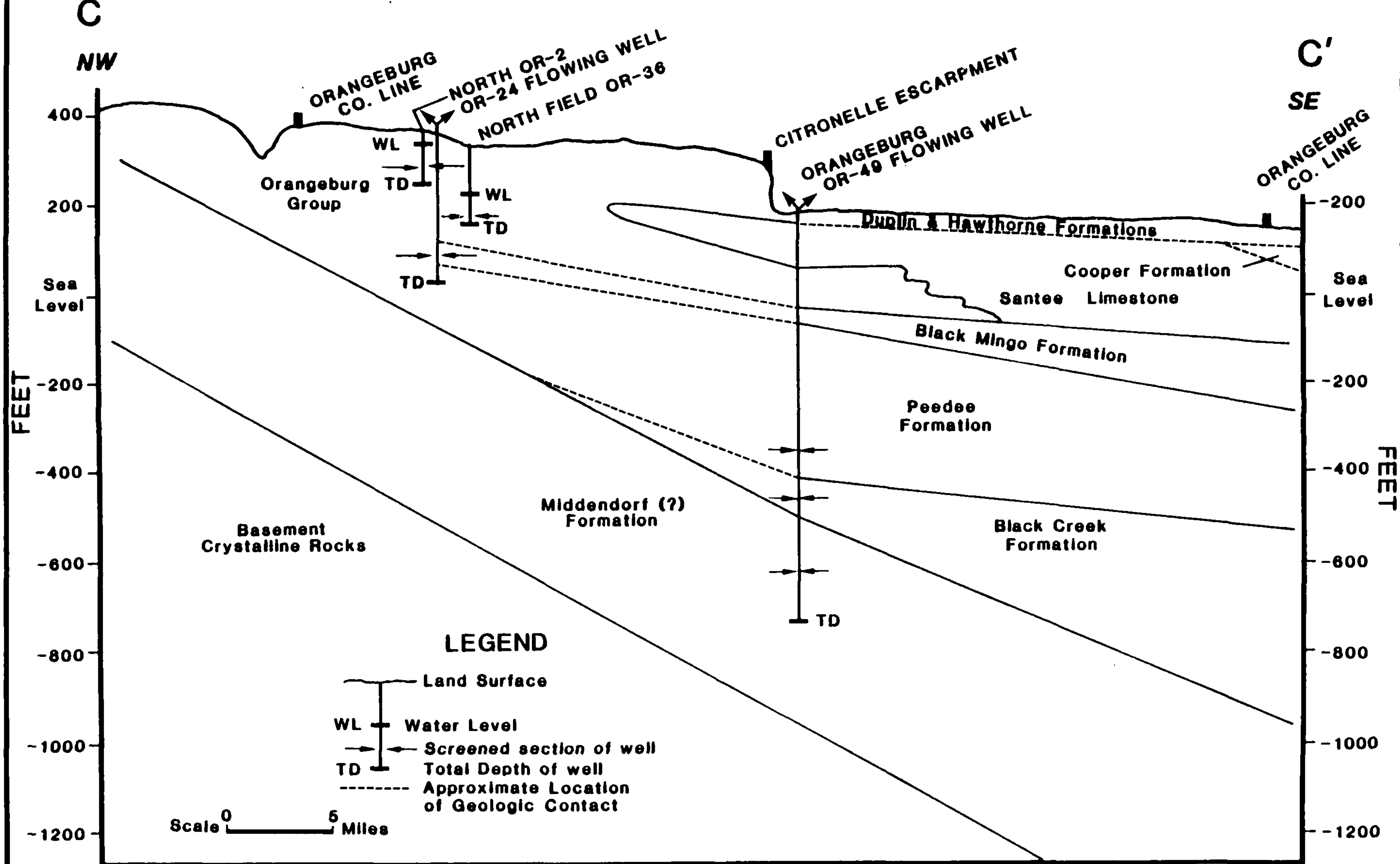
FIGURE D.6



ES ENGINEERING-SCIENCE

FIGURE D.7

HYDROGEOLOGIC CROSS-SECTION C–C′
IN VICINITY OF NORTH AUXILIARY AIR FIELD



SOURCE: SIPLE, 1975 AND WILLAHBY, 1983

NOTE: CROSS-SECTION LOCATION ON FIGURE D.6

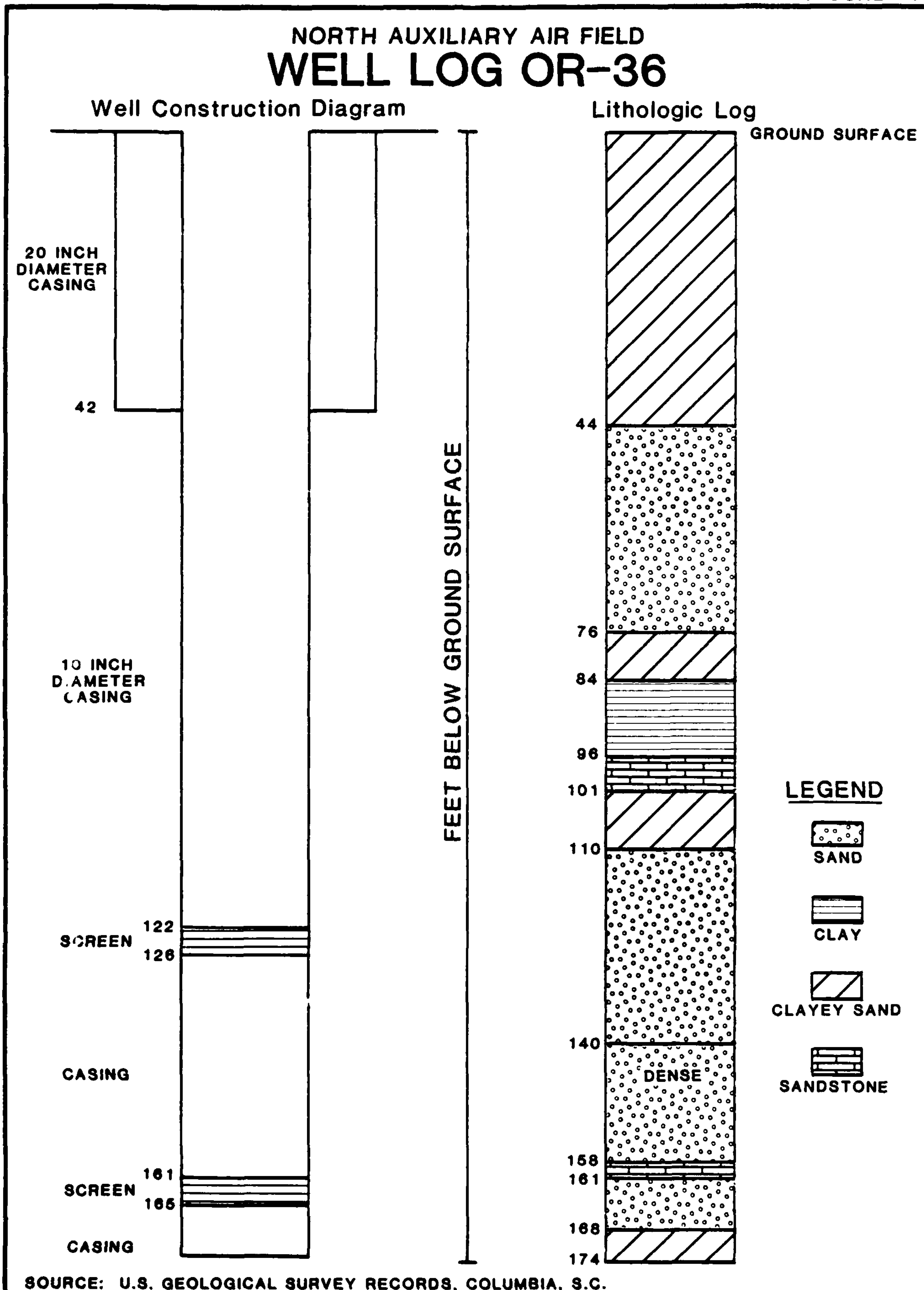
TABLE D.3
NORTH AUXILIARY AIR FIELD HYDROGEOLOGIC UNITS
AND THEIR WATER-BEARING CHARACTERISTICS

System	Series	Hydrogeologic Unit	Hydrogeologic Classification	Approximate Thickness (feet)	Dominant Lithology	Water-Bearing Characterisics
Quaternary	Holocene to Pleistocene	Alluvial Deposits	Flood plain aquifers (unconfined)	32	Sand, fine-to coarse-grained with clay	Readily transmits water. Wells may yield several hundred gpm.
Tertiary	Upper Eocene	Barnwell Formation	Orangeburg Group aquifer (unconfined and confined)	200	Sand interbedded with clay	Readily transmits water. Data from Barnwell County to the south-west indicates transmissivity values from 50,000 to 100,000 gpd/ft. Well yields in Orangeburg County range from 50 to 400 gpm. The McBean and Congaree are the most productive formations.
	Middle Eocene	McBean Formation				
		Congaree Formation / Warley Hill Formation				
	Lower Eocene	Black Mingo	Confined aquifer	50	Sand and sandstone or bioclastic *limestone interbedded* with shale.	Moderately transmits water. Well OR-24 near North Field yields 40 gpm *under flowing artesian* conditions.
Cretaceous	Upper Cretaceous	Peedee Formation	Confined aquifer	150	Sand interbedded with marl, limestone and clay	Readily transmits water. Wells may yield several hundred gpm.
		Middendorf(?) Formation	Confined aquifer	400	Sand and gravel interbedded with kaolinitic clay	Readily transmits water. Data from Barnwell County to the southwest indicates transmissivity values up to 400,000 gpd/ft. Well PSP-26709 in North yields 759 gpm.
Permian to Precambrian	Basement crystalline rocks and sedimentary rock of Triassic Age		Limited confined aquifer in fractured rock if present	Unknown	Gneiss and sandstone	Moderately transmits water where fractured. Data from Barnwell County indicates transmissivities from 22 to 330 gpd/ft.

Source: Siple, 1975 and Willahby, 1983

Notes: gpm = gallons per minute
gpd/ft = gallons per day per foot

FIGURE D.8



ES ENGINEERING-SCIENCE

wells in the vicinity of North Auxiliary Air Field vary from 37 feet below land surface in well number OR-37 in the town of North to 70 feet in well number OR-35 east of the base. On-base wells OR-36 and OR-46 have reported static water levels below land surface of 100 feet and 112 feet, respectively (Siple, 1975). These water levels expressed in feet of elevation above mean sea level are approximately 220 and 208 feet, respectively, which are the approximate elevations of reported springs initiating intermittent streams south of the south taxiway which discharge into the North Fork Edisto River. This relationship between ground-water levels and ground-water discharge points exemplifies the interconnection between ground water and surface water in the vicinity of the base. Also, a good correlation has been documented between precipitation, ground-water level fluctuations and discharge volumes of the North Fork Edisto River between North and Orangeburg, South Carolina. A decline in precipitation was closely followed by a decline in ground-water levels in North and a corresponding decrease in river discharge volumes at Orangeburg (Siple, 1975).

Underlying the Orangeburg Group aquifers are additional confined aquifers of Lower Eocene and Upper Cretaceous ages. The Black Mingo and Peedee Formations are not used extensively in the vicinity of North Auxiliary Air Field. The Middendorf (?) Formation, a major aquifer in the Upper Coastal Plain province, underlies the Peedee Formation. The stratigraphic nomenclature and geologic dates of the Middendorf Formation are at present unresolved, so a question mark follows its name. One well in North taps the Peedee and Middendorf (?) Formations. The hydraulic heads (static water levels) of the Black Mingo, Peedee and Middendorf (?) Formations are higher than hydraulic heads of the Orangeburg Group confined aquifers underlying North Auxiliary Air Field. Therefore, an upward vertical ground-water movement condition exists at the base. This condition is not the same for other areas in the vicinity of the base due to varying confined aquifers within the Orangeburg Group and varying water level fluctuations. Approximate water level elevations and other water well data are presented in Table D.4.

Ground-Water Quality

The ground-water quality in the Orangeburg Group aquifers is generally good except for the content of iron which occasionally exceeded

TABLE D.4
WATER WELL DATA FOR NORTH AUXILIARY AIR FIELD AND VICINITY

Well Identi-fication	Owner &/or Location	Depth (feet)			Diameter (inches)	Hydrogeologic Unit(s) Tapped by Well	Water Level (feet)			Yield (gpm)	Use
		Casing	Screen	Total			Above (+) or below(-) land surface	Date	Approximate Elevations Above NGVD		
OR-22	Coastal Public Service Corpora-tion, North	NR	NR	110	6	To	-32	02/-/50	240	40	Industrial
OR-24	Jr. Chamber of Commerce Park, North	130	70	200	2	Tbm	+10	06/-/54	230	40	Public Supply
OR-35	E. B. Mack, Hwy 178 east of North Field	140	31	171	8	To	-70	09/28/56	250	350	Irrigation
OR-36	North Field	166	8	174	10	To	-100	08/29/56	220	150	Military
OR-37	North	108	16	124	8	To	-37	08/14/57	230	260	Public Supply
OR-46	North Field	180	15	195	6	To	-112	02/05/63	210	50	Military
OR-78	North	NR	NR	133	8	To	-30	09/25/64	240	300	Public Supply
PSP-26709	North	431	50	481	10	Kp-Km	-38	01/28/80	230	759	Public Supply
PSP-204062	North	110	81	191	10	To	-86	08/18/82	250	608	Public Supply

Notes: Kp = Peedee Formation
Km = Middendorf(?) Formation
NR = Not recorded
Tbm = Black Mingo Formation
To = Orangeburg Group

See Figure D.9 for well location
OR = Orangeburg County
PSP = Public supply permit
gpm = gallons per minute
See Table D.5 for water-quality data

Source: SCDHEC, 1983 and Siple, 1975

the 1962 the U.S. Public Health Service recommended limit of 0.3 milligrams per liter (mg/l). On-base well OR-36 showed an iron content of 1.1 and 2.0 mg/l in samples taken in 1960 and 1961. Well OR-46 showed an iron content of 0.5, 0.9 and 0.76 mg/l in samples taken in 1959, 1960 and 1963, respectively (Siple, 1975). Table D.5 is a tabulation of the ground-water quality for wells at North Auxiliary Air Field and vicinity.

There is only one reported ground-water quality problem in the vicinity of North Auxiliary Air Field. This problem is the occurrence of radium-226 (one of the four isotopes of radium which occur naturally) in wells OR-1A, OR-2A and OR-37 in North. The concentration in these wells were 5.7, 4.6 and 7.1 picocuries per liter pCi/l, respectively, two of which exceed the U.S. EPA National Interim Primary Drinking Water Regulations (1977) recommended limit of 5 pCi/l. Two possible sources for the radium are (1) the mineral monazite which contains thorium and occurs in Tertiary and Cretaceous sediments in the area and (2) radioactive potassium which occurs in feldspathic sands and gravels of the area (Siple, 1975).

Ground-Water Use

Ground-water in the vicinity of North Auxiliary Air Field is used for public water supply, industrial and irrigation purposes. In 1972 the town of North was using 100,000 gpd. Two industries in Orangeburg using ground water have an estimated combined total use of 2.3 mgd ("ACE", 1972). During the base visit (June, 1983), a spray irrigation system served by a well was observed along Highway 178 east of the base. Presently North Auxiliary Air Field is using only one of the two wells on base. Due to the similar well head construction of both wells it is difficult to ascertain which well of the two is presently in use. In the near future North Auxiliary Air Field will obtain drinking water from the town of North, but will still maintain the well as a backup water system (Fallow, 1983). Well locations are shown on Figure D.9.

BIOTIC ENVIRONMENT

Although the North Auxiliary Air Field biotic environment has not been studied as extensively as the environment at Charleston AFB, two main areas have been identified. The larger of the two areas consists

TABLE D.5

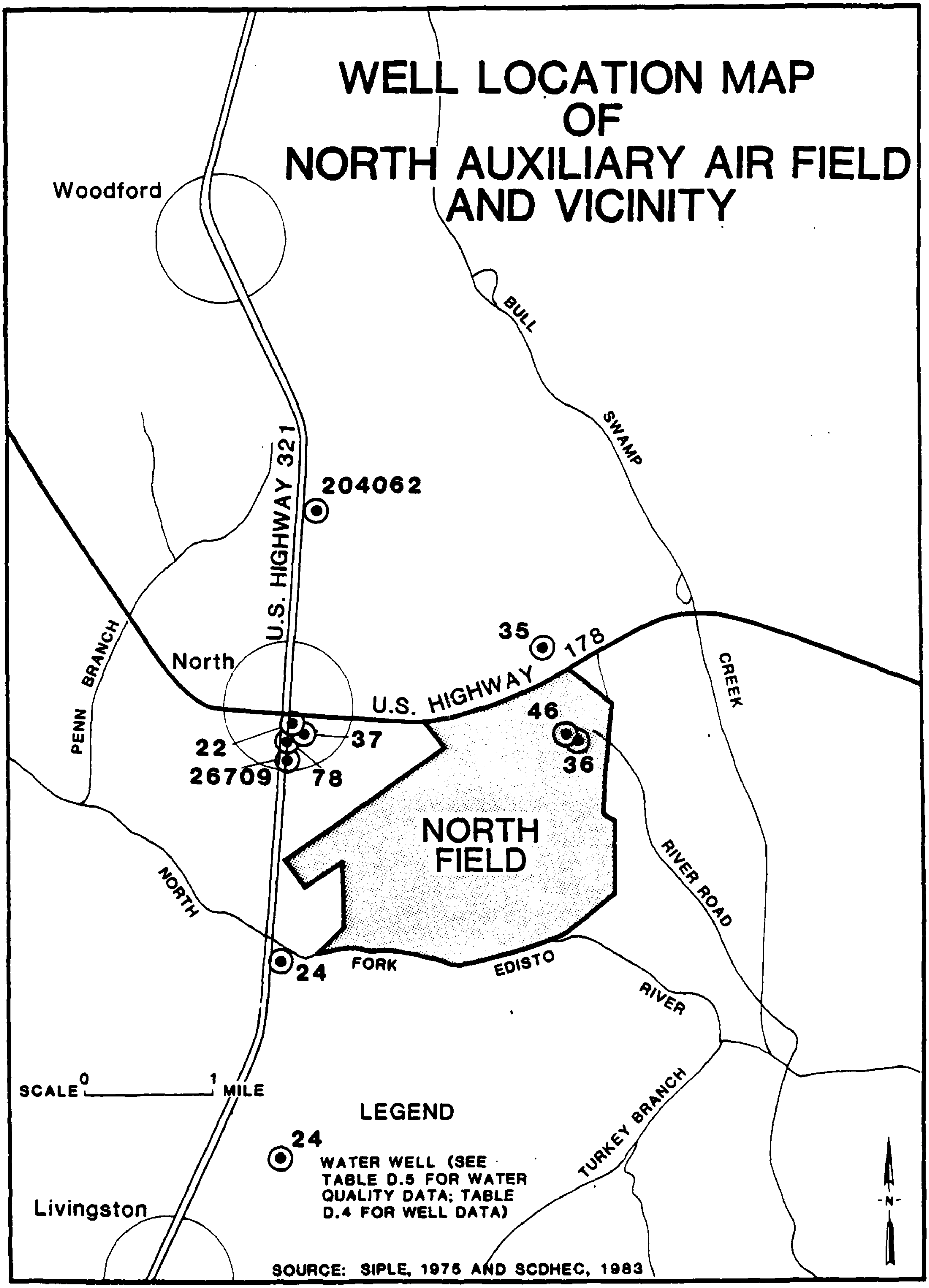
GROUND-WATER QUALITY DATA FOR NORTH AUXILIARY AIR FIELD AND VICINITY

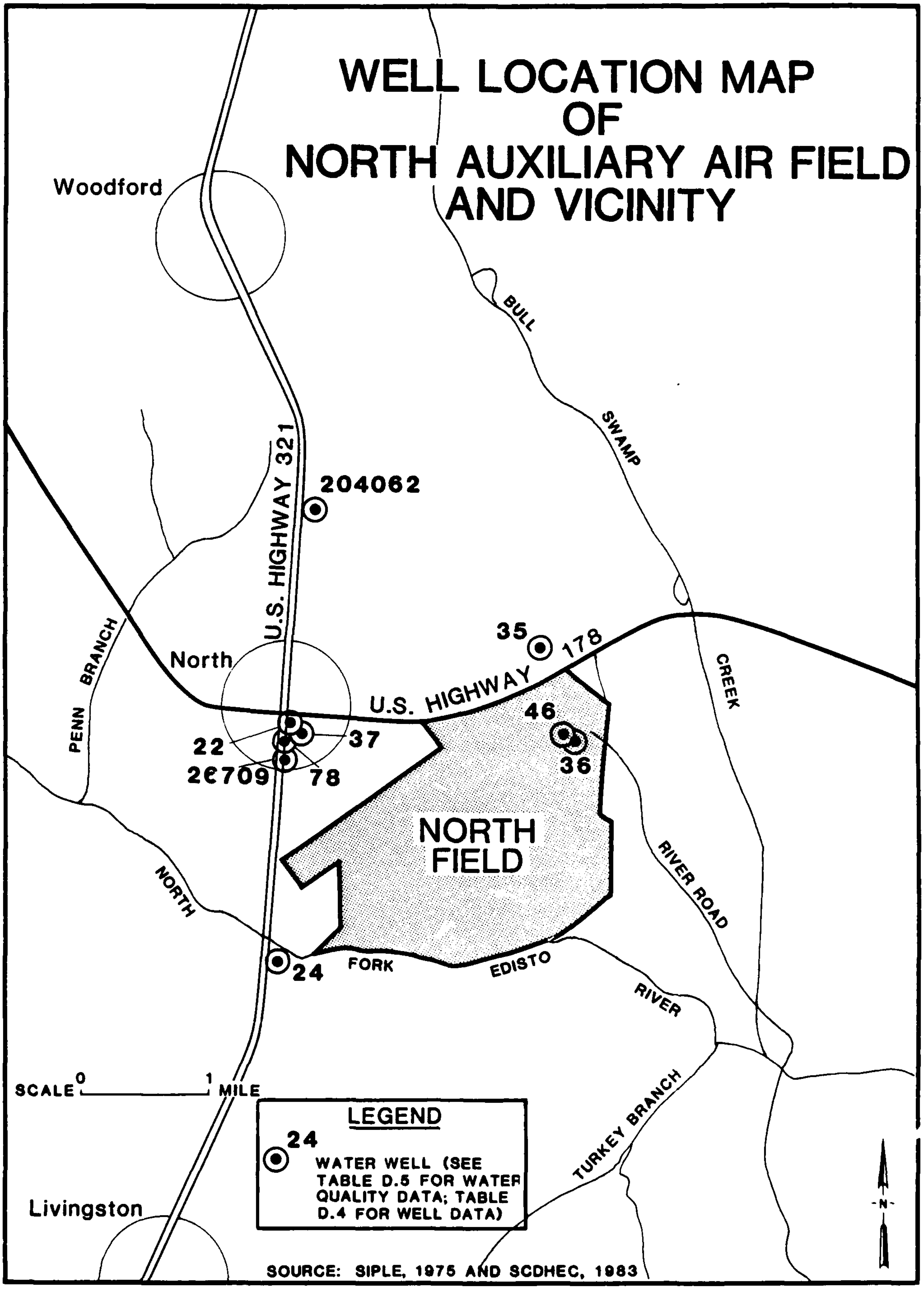
Well Identification	Date	Selected Parameters: pH	Specific Conductance (umhos/cm)	Total Dissolved Solids (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	Iron (ug/l)	Sulfate (mg/l)	Calcium (mg/l)	Magnesium (mg/l)	Bicarbonate (mg/l)	Silica (mg/l)
OR-22, North	02/27/50	5.0	NA	NA	8	0.0	560	NA	NA	NA	3	NA
OR-24, North	06/25/54	4.1	59.1	29	2.5	0.0	460	8.3	0.9	0.2	NA	10
OR-36, North Air Field	02/05/63	5.8	32	17	4.0	0.0	280	0.8	0.6	0.2	4.0	5.2
OR-37, North	06/11/58	4.5	81.5	32	14	0.0	10	0.8	1.4	1.2	0.0	10
OR-46, North Air Field	02/05/63	5.5	50	31	6.4	0.0	750	.8	1.0	0.5	3.0	5.7
PSP-26709, North	08/20/80	3.9	NA	90	2.0	<0.1	0.08	2.0	2.0	0.15	0.0	NA

Notes: NA = Not analyzed

See Figure D.9 for well locations
See Table D.4 for well data
umhos/cm = micromhos per centimeter
mg/l = milligrams per liter
ug/l = micrograms per liter

Source: SCDHEC, 1983 and Siple, 1975


WELL LOCATION MAP
OF
NORTH AUXILIARY AIR FIELD
AND VICINITY
Woodford
BULL
SWAMP
CREEK
U.S. HIGHWAY 321
204062
35
178
U.S. HIGHWAY
North
PENN
BRANCH
46
36
22
37
26709
78
NORTH
FIELD
RIVER ROAD
NORTH
FORK
EDISTO
RIVER
24
SCALE 0 1 MILE
LEGEND
24
WATER WELL (SEE TABLE D.5 FOR WATER QUALITY DATA; TABLE D.4 FOR WELL DATA)
TURKEY BRANCH
Livingston
N
SOURCE: SIPLE, 1975 AND SCDHEC, 1983


WELL LOCATION MAP
OF
NORTH AUXILIARY AIR FIELD
AND VICINITY
Woodford
BULL
SWAMP
CREEK
U.S. HIGHWAY 321
204062
PENN BRANCH
North
35
U.S. HIGHWAY 178
46
36
22
37
2C709
78
NORTH
FIELD
RIVER ROAD
NORTH
24
FORK
EDISTO
RIVER
TURKEY BRANCH
SCALE 0 1 MILE
LEGEND
24
WATER WELL (SEE TABLE D.5 FOR WATER QUALITY DATA; TABLE D.4 FOR WELL DATA)
Livingston
N
SOURCE: SIPLE, 1975 AND SCDHEC, 1983

of 510 acres of prime farmland as defined by the Soil Conservation Service; the smaller of the two areas consists of 167 acres of wetlands in flood plains bordering the North F· :k Edisto River. Typical plant species in the wetlands are Black Tupelo, Yellow Poplar, Sweet Bay, Black Willow, Spagnum Moss, Swamp Saw Grass and Green Ash (Land Management Plan, Charleston AFB, 1982). There are no Federally-listed endangered or threatened animal or plant species known to occur on the North Auxiliary Air Field.

Summary of Environmental Setting

The environmental setting data for North Auxiliary Air Field indicate the following data are important when evaluating past hazardous waste disposal practices.

1. The mean annual precipitation is 46.37 inches; the net precipitation is +4 inches and the one-year 24-hour rainfall event is 3.3 inches. These data indicate a relative abundance of rainfall in excess of evaporation plus a potential for storms to create excessive runoff.

2. The soils on-base are typically loamy sand with pebbles and gravel and are poorly drained. The Orangeburg Group sediments (unconfined and confined aquifers) outcrop on base with water-table levels moderately deep (30 to 100 feet). Perched water-table zones may exist on base as evidenced by wet-weather springs. Numerous intermittent streams originate in the wetlands south of the south taxiway. The soils in the wetlands are sandy and very permeable. These data indicate moderately permeable soils with low-water tables on a majority of the base, but very permeable soils with high water tables in the wetlands. These factors are important in that leachate if present will have more potential for movement in the sands of the wetland areas more so than in the Orangeburg Group sediments.

3. The ground water within the Orangeburg Group sediments and the alluvial deposits in the wetland areas may discharge into nearby streams. This fact indicates an interconnection between the ground and surface-water systems. This is important in assessing the movement of leachate from a waste site to nearby streams.

4. The confined aquifers (Black Mingo, Peedee and Middendorf (?) Formations) underlying the Orangeburg Group aquifers have higher hydraulic heads (static water levels) than the hydraulic head within the confined portions of the Orangeburg Group underlying the base. Therefore, an upward vertical ground-water movement condition would prevent any potential contaminants from naturally reaching the Black Mingo, Peedee and Middendorf (?) Formations. This is important in determining the vertical migration of any potential contaminants.

5. There are no Federally-listed endangered or threatened animal or plant species known to occur on the North Auxiliary Air Field.

APPENDIX E

CHARLESTON AFB SUPPLEMENTAL INFORMATION AND DATA

TABLE E.1

LIST OF PESTICIDES CURRENTLY ON-HAND

(June 1983)

Pyrethrin I
Pyrethrin II
Malathion 91.0%
Dursban 10 CR
Dursban M 41.2%
Diazinon Emulsifiable Concentrate 48.2%
Chlordane 8 EC 72%
Spectricide 6,000
Bolt Rodenticide
Del E Rad 35.33%
Sencore 42%
Daconil 2787 75%
Fore 62%
Betamec 46%
Koban 30%
Kerb 50%
Balan 2.5%

Source: Charleston AFB Records.

TABLE E.2

LIST OF MAJOR PETROLEUM PRODUCT STORAGE TANKS AT CHARLESTON AFB

Location	Number of Tanks	Tank Volume (gallons)	Description
JP-4 STORAGE TANKS			
Bulk Storage Area	1	210,000	Above Ground
Building 575	1	3,000	Underground
JET FUEL			
Bulk Storage Area	1	2,310,000	Above Ground
Bulk Storage Area	1	315,000	Above Ground
Bulk Storage Area	2	210,000	Above Ground
JP-4 OR JET FUEL			
MAC Maintenance Apron (east side of apron taxiway)	12	50,000	Underground
DESP	7	3,360,000	Above Ground
DIESEL			
Bulk Storage Area	1	10,000	Above Ground
MOGAS			
Building 575	1	1,000	Underground
Base Service Station	2	10,000	Underground

TABLE E.2 (Continued)

LIST OF MAJOR PETROLEUM PRODUCT STORAGE TANKS AT CHARLESTON AFB

Location	Number of Tanks	Tank Volume (gallons)	Description
DIESEL #2 (HEATING FUEL)			
Building 2030	1	1,000	Above Ground
TAC Area	1	1,000	Above Ground
TAC Area	1	250	Above Ground
Building 702	1	500	Above Ground
Building 682	1	250	Above Ground
Building 900	1	250	Above Ground
Building 1135	2	250	Above Ground
Building 1136	1	250	Above Ground
Building 1137	1	250	Above Ground
Defense Fuel Supply Agency (N.Rhett Ave. Facility)	7	7,00,000 (Nominal)	Above Ground

Source: Charleston AFB Liquid Fuel Plan, March 1979.

TABLE E.3

SOIL ANALYSIS FOR EAST PORTION OF LANDFILL NO. 3
MARCH 1983

Parameter	Concentratons of Parameters in Parts per Million					
	#1 Top	#1 Bottom	#2 Top	#2 Bottom	#3 Top	#3 Bottom
Arsenic	0.17	0.20	0.14	0.14	0.20	0.18
Barium	6.45	7.75	18.5	11.9	8.32	11.34
Cadmium	<0.04	<0.04	0.08	0.11	<0.04	<0.04
Chromium	5.72	6.36	19.6	9.36	6.40	5.00
Mercury	1.04	1.14	2.57	2.54	1.69	1.77
Lead	7.9	7.5	198	103	6.7	7.4
Selenium	0.058	0.059	0.039	0.012	0.059	0.087
Silver	0.44	0.50	0.93	0.92	0.70	0.66
Nickel	2.36	2.64	2.64	2.44	2.92	2.76

Source: Charleston AFB Files. Documentation of depths and locations of top and bottom samples not available.

TABLE E.4

LIST OF OIL/WATER SEPARATORS

Building Number	Tank or Sump Liquid Storage Capacity, gal
61	2000
178	200
201	500
210	1000
250	2000
325	50
355	1000
370	50
407	1000
446	2000
517	1000
546	1000
548	500
570	500
575	200
637	500
639	200
665	80
684	200
688	500
700	500
700	500

Source: Charleston AFB Files.

APPENDIX F

MASTER LIST OF INDUSTRIAL SHOPS

APPENDIX F
MASTER LIST OF INDUSTRIAL SHOPS

Name	Present Location (Building No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical Treatment, Storage, Disposal Methods
437th AIR BASE GROUP (ABG)				
Small Arms Training	910/3604	No	No	-
Aircrew Life Support	444	Yes	No	-
81st AERIAL PORT SQUADRON (APS)				
Fleet Service	166	No	No	Incineration (USDA requirement)
Cargo Procurement	178	Yes	No	-
Packing and Crating	611	Yes	No	-
Ramp Service	178	No	No	-
Special Handling	178	No	No	-
Recouperage	178	No	No	-
Welding	178	Yes	No	-
1361st AUDIOVISUAL SQUADRON				
Audiovisual Lab	235	Yes	Yes	Drummed and taken to Silver Recovery at NDI Shop
437th AVIONICS MAINTENANCE SQUADRON (AMS)				
Auto Pilot	68	No	No	-
Inertial Nav. Sys.	68	Yes	No	-
Instrument	68	Yes	No	-
PMEL	707	Yes	Yes	Mercury bottled and shipped to Robins AFB
Radar	68	Yes	No	-
Radio	68	Yes	No	-
437th CIVIL ENGINEERING SQUADRON (CES)				
Entomology	717	Yes	Yes	Residues to holding tank, Contractor disposes of contents off-base
Exterior Electric	662	No	No	-
Fire Extinguisher Maintenance	168	No	No	-
Golf Course Maintenance	371	Yes	Yes	Pesticide rinse to storm drain; waste oils drummed and taken to Auto Hobby Shop
Grounds Maintenance	666	Yes	Yes	DPDO
Interior Electric	662	No	No	-
Equipment	666	Yes	No	-

Name	Present Location (Building No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical Treatment, Storage, Disposal Methods
437th CIVIL ENGINEERING SQUADRON (CES) (CONT.)				
Pavement	661	Yes	No	-
Plumbing	662/3486	No	No	-
Power Production	659/2303	Yes	Yes	DPDO
POL Maintenance	659	Yes	Yes	DPDO
Refrigeration	3365	No	No	-
Heating Plant	425	No	No	-
Heating Plant Maintenance	431/2492	Yes	Yes	DPDO
Structural	661	Yes	Yes	DPDO
Water and Waste	1998	No	No	-
Carpenter Shop	662	No	No	-
Mason Shop	662	No	No	-
Sheet Metal and Welding	662	No	No	-
Paint Shop	659	Yes	Yes	DPDO
USAF CLINIC				
Dental Clinic	500	Yes	Yes	Spent fixer undergoes Electrolytic Silver Recovery at Dental Clinic; silver scrapings are sent to Medical Supply
Dental Clinic Lab	500	Yes	No	-
Medical Lab	1000	Yes	No	Incineration of pathological waste
Medical X-Ray	1000	Yes	Yes	Spent fixer undergoes Electrolytic Silver Recovery at Medical X-Ray
Veterinarian	423	Yes	No	-
1968th COMMUNICATIONS SQUADRON				
Radio	129	No	No	-
Teletype Maintenance	129	Yes	No	-
437th FIELD MAINTENANCE SQUADRON (FMS)				
AGE Shop	548/575/576	Yes	Yes	DPDO; Oil/Water Separator pumped out by Contractor or CE
Component Repair	544	Yes	No	-
Engine Test Cell	545	Yes	Yes	DPDO; Oil/Water Separator pumped out by Contractor or CE
Environmental Systems	58	Yes	Yes	DPDO
Fuel Systems	532/517	Yes	Yes	DPDO; Oil/Water Separator pumped out by Contractor or CE

Name	Present Location (Building No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical Treatment, Storage, Disposal Methods
437th FIELD MAINTENANCE SQUADRON (FMS) (CONT.)				
Gas Turbine Engine	548	Yes	Yes	DPDO
Machine Shop	536	Yes	Yes	DPDO
NDI	536	Yes	Yes	Silver from Silver Recovery sent to DPDO
Corrosion Control	536	Yes	Yes	DPDO
Parachute and Fabric	453	Yes	No	-
Pneudraulics (Hydraulics)	532	Yes	Yes	DPDO; Oil/Water Separator pumped out by Contractor or CE
Aero Repair	532/570	Yes	Yes	DPDO
Refurbishing Hangar	570	Yes	Yes	DPDO
Battery Shop (Electric Shop)	58	Yes	Yes	DPDO; Neutralized to Sanitary Sewer
Rubber Shop	710	Yes	No	-
Structural Repair	536	No	No	-
Jet Engine Shop	544/3594	Yes	Yes	DPDO; Oil/Water Separator pumped out by Contractor or CE
Welding Shop	536	Yes	No	-
Wheel and Tire Shop	574	Yes	Yes	DPDO
Aircraft Washrack	59	Yes	Yes	Oil/Water Separator pumped out by Contractor or CE
MORALE-WELFARE AND RECREATION (MWR)				
Auto Hobby Shop	637	Yes	Yes	DPDO; Oil/Water Separator pumped out by Contractor or CE
Bowling Alley Maintenance	214	No	No	-
Ceramic Shop	636	No	No	-
Wood Hobby Shop	637	No	No	-
Golf Cart Maintenance	370	No	No	-
437th ORGANIZATIONAL MAINTENANCE SQUADRON (OMS)				
Flightline	78	Yes	No	-
Inspections	700	Yes	Yes	DPDO
Support Equipment	710	Yes	Yes	DPDO
TRANSPORTATION SQUADRON				
Allied Trades	403/407	Yes	No	-

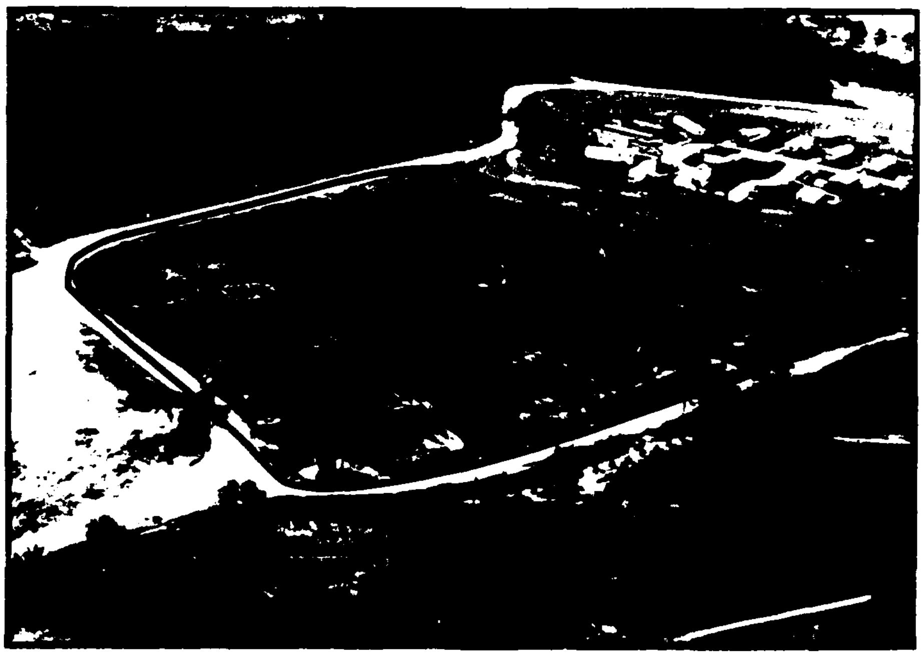
Name	Present Location (Building No.)	Handles Hazardous Materials	Generates Hazardous Wastes	Typical Treatment, Storage, Disposal Methods
TRANSPORTATION SQUADRON (CONT.)				
Battery Shop	407	Yes	Yes	Neutralized to Sanitary Sewer
463L Maintenance	407	Yes	No	-
Machine Shop	407	No	No	-
Refueling Maintenance	688	Yes	Yes	DPDO; Oil/Water Separator pumped out by Contractor or CE
Wheel and Tire	407	No	No	-
Tune-Up Shop	407	Yes	Yes	DPDO
Minor Maintenance	407	Yes	Yes	DPDO
General Purpose Maintenance	407	Yes	Yes	DPDO; Oil/Water Separator pumped out by Contractor or CE
Firetruck Maintenance	168	Yes	Yes	DPDO
Special Purpose Maintenance	407	Yes	Yes	DPDO
87th FIGHTER INTERCEPTOR SQUADRON (FIS)				
Maintenance Facility	2000	Yes	Yes	DPDO
OTHER ON-BASE SHOPS				
Aero Club	702	Yes	Yes	DPDO
Trident Technical College	2030	Yes	Yes	Motor Pool on Trident Technical College Main Campus and Storm drain

APPENDIX G

PHOTOGRAPHS

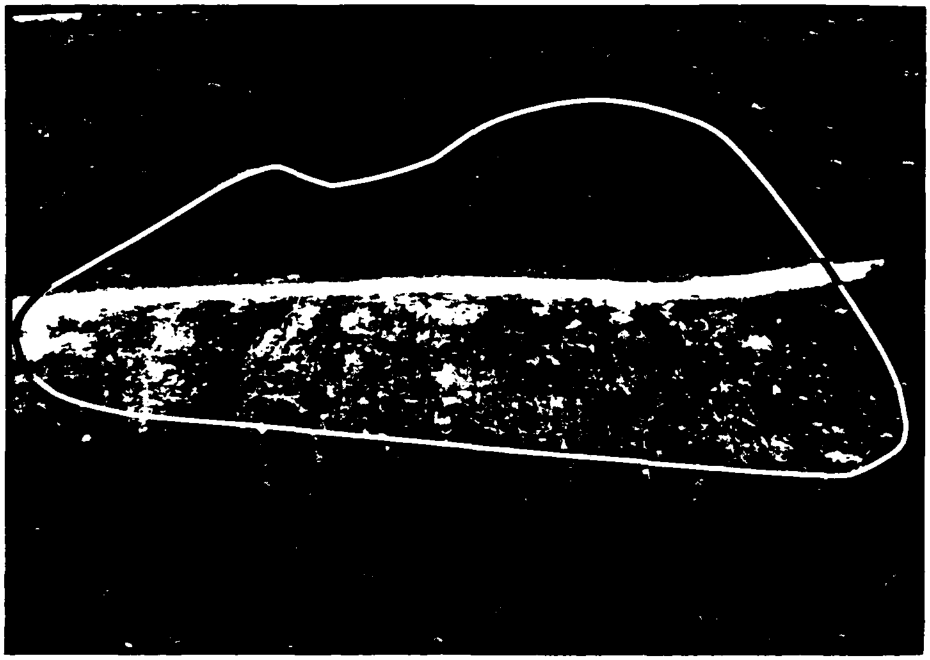
CHARLESTON AFB

LANDFILL AREAS NO. 1 AND 2



LANDFILL AREA NO. 3
(East Area)

CHARLESTON AFB

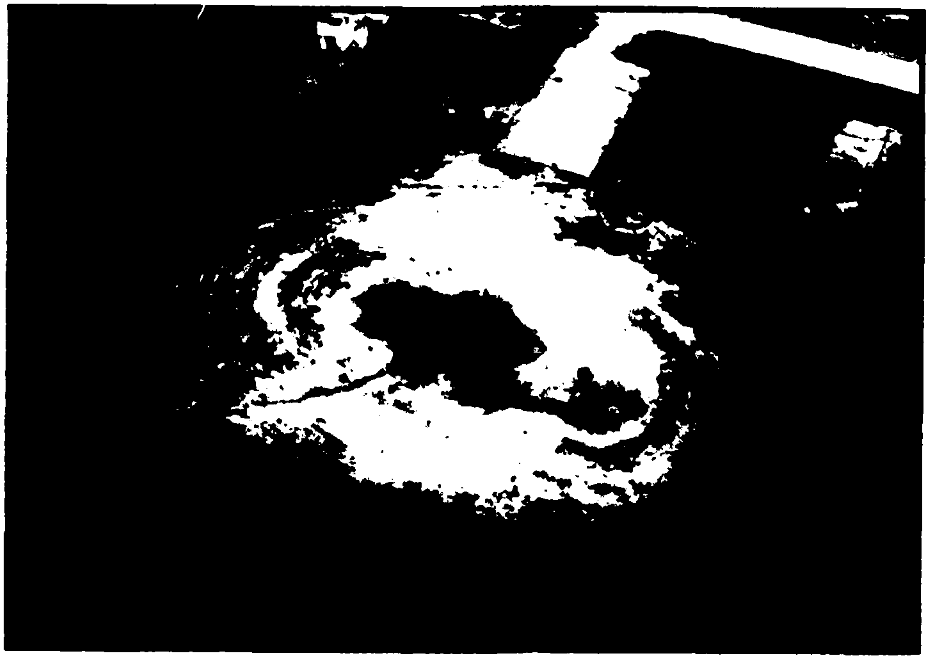


HARDFILL AREA NO. 1

DEFENSE FUEL SUPPORT POINT

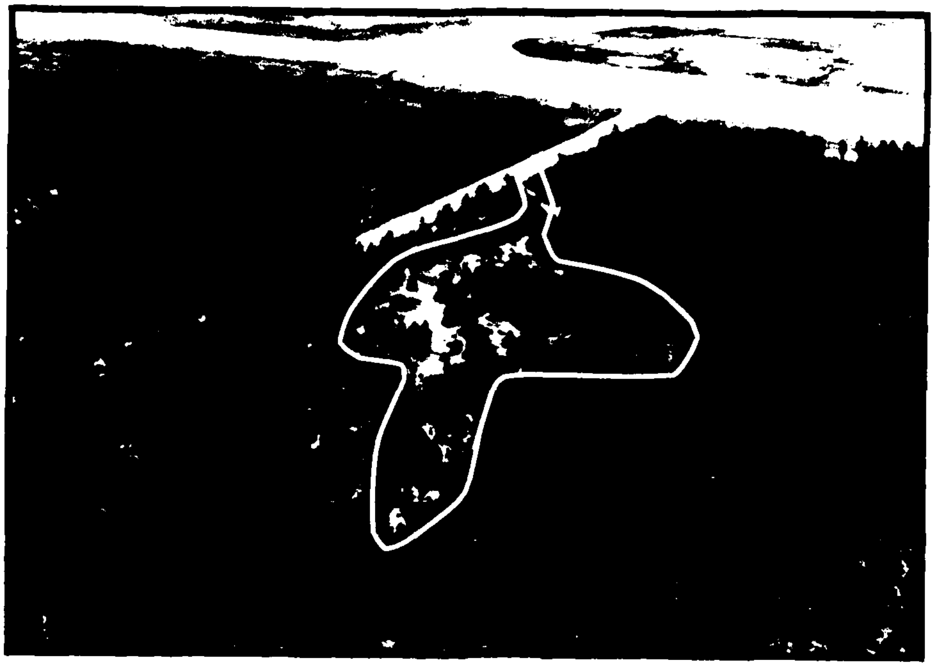
CHARLESTON AFB

LANDFILL AREA NO. 4



FIRE PROTECTION
TRAINING AREA NO. 3

NORTH FIELD



LANDFILL AREA NO. 1

LANDFILL AREA NO. 3

APPENDIX H

USAF INSTALLATION RESTORATION PROGRAM
HAZARD ASSESSMENT RATING METHODOLOGY

APPENDIX H

USAF INSTALLATION RESTORATION PROGRAM
HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, aa December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Secords Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with represenatives from USAF Occupational and Environmental Health Laboratory (OEHL), Air Force Engineering and Services Center (AFESC), Engineering-Science (ES) and CH2M Hill. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF OEHL, AFESC, various major commands, Engineering-Science, and CH2M Hill met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of the IRP.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DOD program needs.

The model uses data readily obtained during the Records Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DOD properties.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination, the waste and its characteristics, potential pathways for waste contaminant migration, and any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating.

The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence, 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface water migration, flooding, and ground-water migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Sites at which there is no containment are not reduced in score. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

FIGURE 1

HAZARD ASSESSMENT RATING METHODOLOGY FLOW CHART

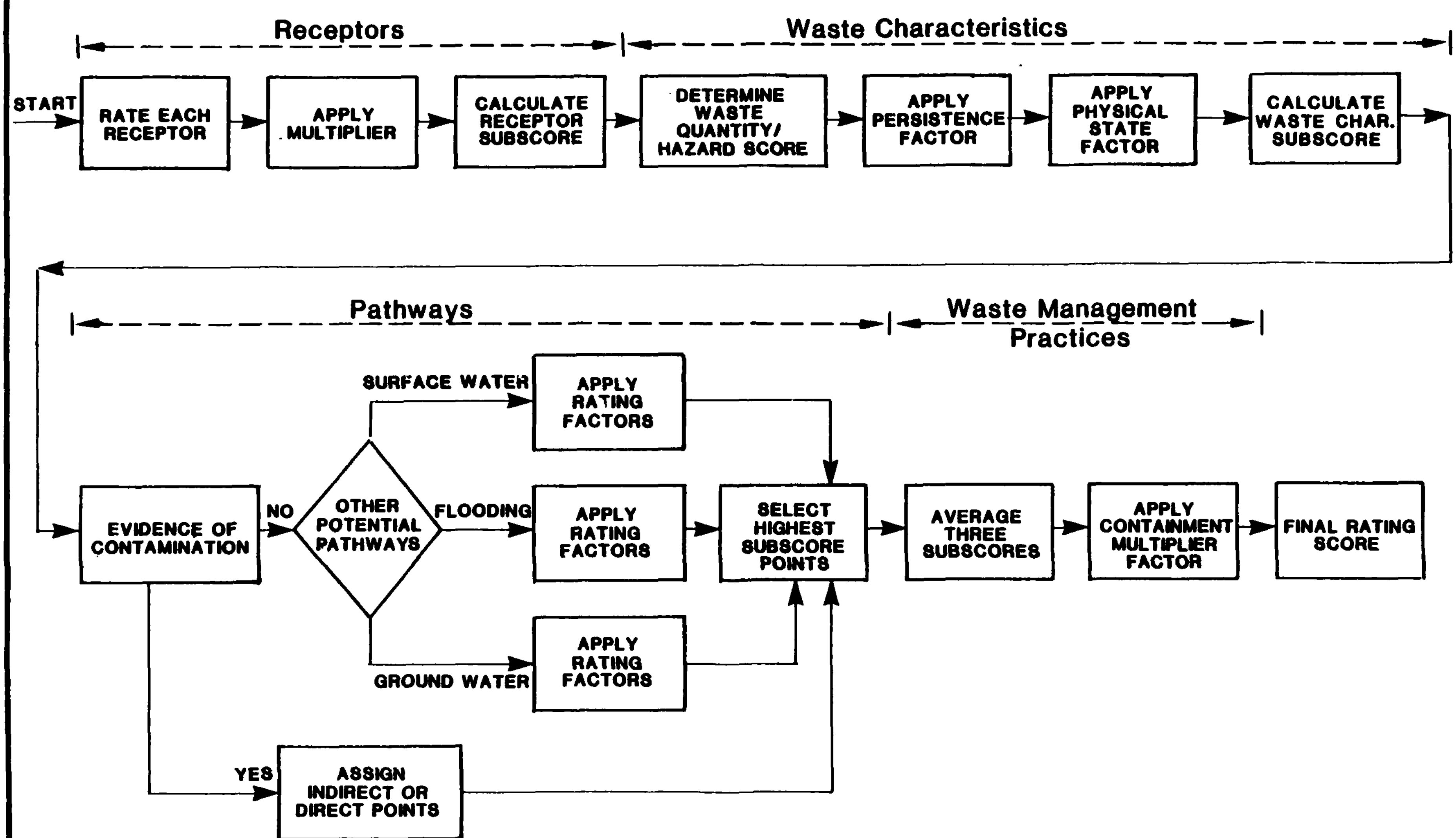


FIGURE 2

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE ______

LOCATION ______

DATE OF OPERATION OR OCCURRENCE ______

OWNER/OPERATOR ______

COMMENTS/DESCRIPTION ______

SITE RATED BY ______

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to reservation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		
		Subtotals	______	______

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ______

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ______
2. Confidence level (C = confirmed, S = suspected) ______
3. Hazard rating (H = high, M = medium, L = low) ______

Factor Subscore A (from 20 to 100 based on factor score matrix) ______

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

______ X ______ = ______

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

______ X ______ = ______

FIGURE 2 (Continued)

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		

Subtotals ______ ______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
2. Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		

Subtotals ______ ______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = ______

TABLE 1

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1 mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination.	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands.	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use.	Recreation, propagation and management of fish and wildlife.	Shellfish propagation and harvesting.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (<5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (>20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records.
- o Knowledge of types and quantities of wastes generated by shops and other areas on base.
- o Based on the above, a determination of the types and quantities of waste disposed of at the site.

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records.
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site.

A-3 Hazard Rating

Hazard Category	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS (Continued)

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:
Confidence Level
- o Confirmed confidence levels (C) can be added
- o Suspected confidence levels (S) can be added
- o Confirmed confidence levels cannot be added with suspected confidence levels

Waste Hazard Rating
- o Wastes with the same hazard rating can be added
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

Rating Factor	Rating Scale Levels 0	1	2	3	Multiplier
B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION					
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 in.	-10 to + 5 in.	+5 to +20 in.	Greater than +20 in.	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1 year 24-hr rainfall	<1.0 inch	1.0-2.0 inches	2.1-3.0 inches	>3.0 inches	8
B-2 POTENTIAL FOR FLOODING					
Floodplain	Beyond 100-year floodplain	In 25-year floodplain	In 10-year floodplain	Floods annually	1
B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION					
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 in	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

IV. **WASTE MANAGEMENT PRACTICES CATEGORY**

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. **WASTE MANAGEMENT PRACTICES FACTOR**

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Fire Proection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1 or III-B-3, then leave blank for calculation of factor score and maximum possible score.

APPENDIX I

HAZARD ASSESSMENT RATING METHODOLOGY FORMS

HAZARD ASSESSMENT RATING METHODOLOGY FORMS
CHARLESTON AFB

TABLE OF CONTENTS

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Defense Fuel Support Point Tank Farm
Location: North Rhett Avenue
Date of Operation or Occurrence: October 1975
Owner/Operator: Charleston AFB
Comments/Description: Major fuel leak

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	2	6	12	18
Subtotals			126	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 70

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 3
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

100 x 0.80 = 80

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

80 x 1.00 = 80

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 100

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	0	8	0	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	0	6	0	18
Rainfall intensity	0	8	0	24
Subtotals			0	108
Subscore (100 x factor score subtotal/maximum score subtotal)				0
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	0	8	0	24
Net precipitation	0	6	0	18
Soil permeability	0	8	0	24
Subsurface flows	0	8	0	24
Direct access to ground water	0	8	0	24
Subtotals			0	114
Subscore (100 x factor score subtotal/maximum score subtotal)				0

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 100

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	70	
Waste Characteristics	80	
Pathways	100	
Total 250 divided by 3 =		83 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

83 x 0.95 = 79

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 4
Location: South of Small Arms Range
Date of Operation or Occurrence: 1968 - 1972
Owner/Operator: Charleston AFB
Comments/Description: Closed site, no burning

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	1	6	6	18
Subtotals			110	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 61

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

80 x 0.90 = 72

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

72 x 1.00 = 72

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 80

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			66	108
Subscore (100 x factor score subtotal/maximum score subtotal)				61
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals			92	114
Subscore (100 x factor score subtotal/maximum score subtotal)				81

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 81

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	61
Waste Characteristics	72
Pathways	81
Total 214 divided by 3 =	71 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

71 x 1.00 = 71

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Fire Protection Training Area No. 1
Location: South off end of Runway 03
Date of Operation or Occurrence: 1960 - 1965
Owner/Operator: Charleston AFB
Comments/Description: Closed site, burned misc. wastes

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	2	6	12	18
Subtotals			98	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 54

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

80 x 1.00 = 80

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

80 x 1.00 = 80

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			74	108
Subscore (100 x factor score subtotal/maximum score subtotal)				69
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			60	114
Subscore (100 x factor score subtotal/maximum score subtotal)				53

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 69

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	54	
Waste Characteristics	80	
Pathways	69	
Total 203 divided by 3 =		68 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

68 x 1.00 = \ 68 \

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 1
Location: Golf Course, 9th Green y TAC Alert Area
Date of Operation or Occurrence: 1953 - 1955
Owner/Operator: Charleston AFB
Comments/Description: Closed landfill site, no burning

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	1	6	6	18
Subtotals			94	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

80 x 0.90 = 72

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

72 x 1.00 = 72

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			74	108
Subscore (100 x factor score subtotal/maximum score subtotal)				69
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals			92	114
Subscore (100 x factor score subtotal/maximum score subtotal)				81

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 81

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	52	
Waste Characteristics	72	
Pathways	81	
Total 205 divided by 3 =		68 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

68 x 1.00 = 68

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 3
Location: West of trailer park
Date of Operation or Occurrence: 1958 - 1968
Owner/Operator: Charleston AFB
Comments/Description: Closed site, some burning

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schnieder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	1	6	6	18
Subtotals			100	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 55

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

80 x 0.90 = 72

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

72 x 1.00 = 72

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi- plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			74	108
Subscore (100 x factor score subtotal/maximum score subtotal)				69
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals			84	114
Subscore (100 x factor score subtotal/maximum score subtotal)				74

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 74

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	56
Waste Characteristics	72
Pathways	74
Total 202 divided by 3 =	67 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

67 x 1.00 = 67

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Entomology Shop (past)
Location: Building T-668
Date of Operation or Occurrence: 1962 - 1982
Owner/Operator: Charleston AFB
Comments/Description: Discharge to ground; french drain

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	1	6	6	18
Subtotals			104	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 58

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

80 x 0.90 = 72

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

72 x 1.00 = 72

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			74	108
Subscore (100 x factor score subtotal/maximum score subtotal)				69
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			60	114
Subscore (100 x factor score subtotal/maximum score subtotal)				53

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 69

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		58
Waste Characteristics		72
Pathways		69
Total	199 divided by 3 =	66 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

66 x 1.00 = 66 FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Dump Site
Location: South of TAC Alert Area
Date of Operation or Occurrence:
Owner/Operator: Charleston AFB
Comments/Description: Dumping of paint debris, contaminated oil filters, absorbent booms

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	2	6	12	18
Subtotals			98	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 54

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

80 x 1.00 = 80

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

80 x 0.75 = 60

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals			92	114
Subscore (100 x factor score subtotal/maximum score subtotal)				81

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 81

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		54
Waste Characteristics		60
Pathways		81
Total	195 divided by 3 =	65 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

65 x 1.00 = 65

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Fire Protection Training Area No. 2
Location: Under tennis courts in park
Date of Operation or Occurrence: 1965 - 1970
Owner/Operator: Charleston AFB
Comments/Description: Tennis court constructed over site, burned misc. wastes

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	1	6	6	18
Subtotals			94	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 2
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 80

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

80 x 1.00 = 80

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

80 x 1.00 = 80

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			66	108
Subscore (100 x factor score subtotal/maximum score subtotal)				61
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			60	114
Subscore (100 x factor score subtotal/maximum score subtotal)				53

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 61

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		52	
Waste Characteristics		80	
Pathways		61	
Total	193 divided by 3 =		64 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

64 x 1.00 = 64

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Fire Protection Training Area
Location: North Field
Date of Operation or Occurrence: Presently used
Owner/Operator: Charleston AFB
Comments/Description: Small amounts of diesel fuel and oil burned with wood and brush

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	1	3	3	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	3	6	18	18
G. Ground water use of uppermost aquifer	3	9	27	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			148	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 82

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 0.80 = 48

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

48 x 1.00 = 48

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	2	6	12	18
Rainfall intensity	3	8	24	24
Subtotals			66	108
Subscore (100 x factor score subtotal/maximum score subtotal)				61
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	1	8	8	24
Net precipitation	1	6	6	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			30	114
Subscore (100 x factor score subtotal/maximum score subtotal)				26

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 61

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		82	
Waste Characteristics		48	
Pathways		61	
Total	191 divided by 3 =		64 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

64 x 1.00 = \ 64 \

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Hardfill Area No. 3
Location: Approach zone of Runway 03
Date of Operation or Occurrence:
Owner/Operator: Charleston AFB
Comments/Description: Ash and hardfill

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	1	6	6	18
Subtotals			92	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 51

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 1.00 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.00 = 60

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			74	108
Subscore (100 x factor score subtotal/maximum score subtotal)				69
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals			92	114
Subscore (100 x factor score subtotal/maximum score subtotal)				81

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 81

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		51
Waste Characteristics		60
Pathways		81
Total	192 divided by 3 =	64 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

64 x 1.00 = 64

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill Area No. 3
Location: Approach zone of Runway 33
Date of Operation or Occurrence:
Owner/Operator: Charleston AFB
Comments/Description: Ash and landfill

Site Rated by: Roger Mayfield, Dan Hannon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	1	6	6	18
Subtotals			92	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 51

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 1.00 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.00 = 60

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			74	108
Subscore (100 x factor score subtotal/maximum score subtotal)				69
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals			92	114
Subscore (100 x factor score subtotal/maximum score subtotal)				81

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 81

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	51
Waste Characteristics	60
Pathways	81
Total	192 divided by 3 = 64 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

64 x 1.00 = 64

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Hardfill Area No. 1
Location: East side of base, Runway 33 clear zone
Date of Operation or Occurrence:
Owner/Operator: Charleston AFB
Comments/Description: Miscellaneous debris

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	2	6	12	18
Subtotals			98	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 54

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 1.00 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 0.75 = 45

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals			92	114
Subscore (100 x factor score subtotal/maximum score subtotal)				81

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 81

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	54	
Waste Characteristics	45	
Pathways	81	
Total 180 divided by 3 =		60 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

60 x 1.00 = 60

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Base Gasoline Station Leak
Location: Near Building 204
Date of Operation or Occurrence: 1983
Owner/Operator: Charleston AFB
Comments/Description: Leak of underground tank

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	1	6	6	18
Subtotals			94	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 0.80 = 48

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

48 x 1.00 = 48

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			66	108
Subscore (100 x factor score subtotal/maximum score subtotal)				61
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals			92	114
Subscore (100 x factor score subtotal/maximum score subtotal)				81

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 81

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	52	
Waste Characteristics	48	
Pathways	81	
Total 181 divided by 3 =		60 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

60 x 1.00 = 60

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Hazardous Waste Storage Area No. 2
Location: Near CE compound
Date of Operation or Occurrence: 1981 - present
Owner/Operator: Charleston AFB
Comments/Description: Current storage of hazardous wastes - drums and tanks

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	1	6	6	18
Subtotals			104	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 58

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 0.90 = 54

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

54 x 1.00 = 54

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			74	108
Subscore (100 x factor score subtotal/maximum score subtotal)				69
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			60	114
Subscore (100 x factor score subtotal/maximum score subtotal)				53

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 69

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	58	
Waste Characteristics	54	
Pathways	69	
Total 181 divided by 3 =		60 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

60 x 1.00 = 60

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Salvage Material Storage Yard
Location: Across from CE Compound
Date of Operation or Occurrence: Present
Owner/Operator: Charleston AFB
Comments/Description: Current storage of salvaged material, previous solvent dumping

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	1	6	6	18
Subtotals			104	180

Receptors subscore (*100 x factor score subtotal/maximum* score subtotal) 58

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 1.00 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.00 = 60

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			66	108
Subscore (100 x factor score subtotal/maximum score subtotal)				61
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			60	114
Subscore (100 x factor score subtotal/maximum score subtotal)				53

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 61

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		58	
Waste Characteristics		60	
Pathways		61	
Total	179 divided by 3 =		60 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

60 x 1.00 = 60

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Entomology Shop Building (present)
Location: Building 714
Date of Operation or Occurrence: 1982 - present
Owner/Operator: Charleston AFB
Comments/Description: Underground tank, vehicle wash to ground

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	1	6	6	18
Subtotals			104	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 58

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 0.90 = 54

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

54 x 1.00 = 54

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			66	108
Subscore (100 x factor score subtotal/maximum score subtotal)				61
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	1	8	8	24
Direct access to ground water	2	8	16	24
Subtotals			76	114
Subscore (100 x factor score subtotal/maximum score subtotal)				67

C. Highest pathway subscore.
Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		58	
Waste Characteristics		54	
Pathways		67	
Total	179 divided by 3 =		60 Gross total score

B. Apply factor for waste containment from waste management practices.
Gross total score x waste management practices factor = final score

60 x 1.00 = \ 60 \
FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Landfill No. 2
Location: Golf Course, 10th Fairway
Date of Operation or Occurrence: 1956 - 1958
Owner/Operator: Charleston AFB
Comments/Description: Closed landfill site, daily burning

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	1	6	6	18
Subtotals			94	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 1.00 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 0.75 = 45

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			74	108
Subscore (100 x factor score subtotal/maximum score subtotal)				69
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	2	8	16	24
Direct access to ground water	3	8	24	24
Subtotals			92	114
Subscore (100 x factor score subtotal/maximum score subtotal)				81

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 81

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	52	
Waste Characteristics	45	
Pathways	81	
Total 178 divided by 3 =		59 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

59 x 1.00 = 59

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Hazardous Waste Storage Area No. 1
Location: Fenced area adjacent to Buildings 665 and 659
Date of Operation or Occurrence: 1953 to early 1960's
Owner/Operator: Charleston AFB
Comments/Description: Storage and spills of paint, oil, and oil transformers

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	2	10	20	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	1	6	6	18
Subtotals			104	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 58

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 0.90 = 54

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

54 x 1.00 = 54

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			66	108
Subscore (100 x factor score subtotal/maximum score subtotal)				61
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			60	114
Subscore (100 x factor score subtotal/maximum score subtotal)				53

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 61

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	58
Waste Characteristics	54
Pathways	61
Total 173 divided by 3 =	58 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

58 x 1.00 = 58

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Fire Demonstration Area No. 2
Location: Behind Building 49
Date of Operation or Occurrence: 1963 - 1966
Owner/Operator: Charleston AFB
Comments/Description: Few fires

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	1	6	6	18
Subtotals			94	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 0.80 = 48

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

48 x 1.00 = 48

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			66	108
Subscore (100 x factor score subtotal/maximum score subtotal)				61
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			60	114
Subscore (100 x factor score subtotal/maximum score subtotal)				53

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 61

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		52
Waste Characteristics		48
Pathways		61
Total	161 divided by 3 =	54 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

54 x 1.00 = \ 54 \

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Fire Demonstration Area No. 1
Location: South of runway in front commercial terminal
Date of Operation or Occurrence: 1963 - 1966
Owner/Operator: Charleston AFB
Comments/Description: Few fires

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	1	4	4	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	2	6	12	18
Subtotals			92	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 51

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 0.80 = 48

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

48 x 1.00 = 48

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			66	108
Subscore (100 x factor score subtotal/maximum score subtotal)				61
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			60	114
Subscore (100 x factor score subtotal/maximum score subtotal)				53

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 61

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	51	
Waste Characteristics	48	
Pathways	61	
Total 160 divided by 3 =		53 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

53 x 1.00 = 53

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Materials Storage Area
Location: East of Building S-611
Date of Operation or Occurrence: between 1954 - 1963
Owner/Operator: Charleston AFB
Comments/Description: Outside storage of hazardous materials in drums; spills

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi- plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	1	6	6	18
Subtotals			94	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 2
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 0.80 = 32

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

32 x 1.00 = 32

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			66	108
Subscore (100 x factor score subtotal/maximum score subtotal)				61
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			60	114
Subscore (100 x factor score subtotal/maximum score subtotal)				53

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 61

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	52	
Waste Characteristics	32	
Pathways	61	
Total 145 divided by 3 =		48 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

48 x 1.00 = 48 FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: North PCB Spill
Location: Near Building 431
Date of Operation or Occurrence: 1980
Owner/Operator: Charleston AFB
Comments/Description: Lightening struck transformer, cleaned up

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	2	6	12	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	1	6	6	18
Subtotals			94	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 52

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 1.00 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.00 = 60

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			74	108
Subscore (100 x factor score subtotal/maximum score subtotal)				69
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			60	114
Subscore (100 x factor score subtotal/maximum score subtotal)				53

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 69

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		52
Waste Characteristics		60
Pathways		69
Total	181 divided by 3 =	60 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

60 x 0.10 = 6

FINAL SCORE

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: South PCB Soil
Location: East of Hill Road, near Building 800
Date of Operation or Occurrence: March 7, 1983
Owner/Operator: Charleston AFB
Comments/Description: Transformer leakage, cleaned up

Site Rated by: Roger Mayfield, Dan Harmon, Ernest Schroeder

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	1	10	10	30
C. Land use/zoning within 1 mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	3	10	30	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	1	6	6	18
Subtotals			109	180

Receptors subscore (100 x factor score subtotal/maximum score subtotal) 61

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 1
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 1.00 = 60

C. Apply physical state multiplier
Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.00 = 60

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface Water Migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	3	8	24	24
Subtotals			74	108
Subscore (100 x factor score subtotal/maximum score subtotal)				69
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			60	114
Subscore (100 x factor score subtotal/maximum score subtotal)				53

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 69

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors		61
Waste Characteristics		60
Pathways		69
Total	190 divided by 3 =	63 Gross total score

B. Apply factor for waste containment from waste management practices.

Gross total score x waste management practices factor = final score

63 x 0.10 = 6

FINAL SCORE

APPENDIX J
REFERENCES

REFERENCES

Behrendt, J. C. and others, 1982. Cenozoic Faulting in the vicinity of Charleston, South Carolina, 1886 Earthquake. Geology, Vol. 9.

Campbell, P., 1983. Personal Communication (June 15, 1983). Federal Emergency Management Agency, Atlanta, Georgia.

Colquhoun, D. J., 1969. Geomorphology of the Lower Coastal Plain of South Carolina. South Carolina Division of Geology Map Series No. 15.

Colquhoun, D. J. and Comer, C. D., 1973. The Stono Arch, A Newly Discovered Breached Anticline Near Charleston, South Carolina. South Carolina Division of Geology Geologic Notes, Vol. 17, No. 4.

Fallow, Sargent, 1983. Personal Communication (June 21, 1983). USAF, North Auxiliary Air Field, South Carolina.

Glowacz, M. E. and others, 1980. Economic and Environmental Impact of Land Disposal of Wastes in the Shallow Aquifers of the Lower Coastal Plain of South Carolina. SCDHEC, Office of Environmental Quality Control, Ground-Water Protection Division.

Gohn, G. S. and others, 1977. Lithostratigraphy of the Deep Corehole (Clubhouse Crossroads Corehole 1) near Charleston, South Carolina, in Studies Related to the Charleston, South Carolina Earthquake of 1886. U.S. Geological Survey Professional Paper 1028-E.

Greene, M. R. and Gori, P. L., 1982. Earthquake Hazards Information Dissemination: A Study of Charleston, South Carolina (Preliminary). U.S. Geological Survey Open-File Report 82-233.

Hill, K., 1983. Personal Communication (July 1, 1983). SCDHEC, Charleston District Office.

Knowles, S. C., 1983. Personal Communication (June 21, 1983). SCDHEC, Stream and Facility Monitoring Section, Environmental Quality Control.

Kohlsaat, T. S., 1983. Personal Communication (June 28, 1983). Supervisor, Nongame and Heritage Trust Section, South Carolina Wildlife and Marine Resources Department, Columbia, South Carolina.

Linton, A. G., 1979. Fuel Problem, Charleston AFB (memo of November 19, 1979). EPA, Federal Activities Coordinator, Atlanta, Georgia.

Linton, A. G., 1980. Fuel Problem, Defense Fuel Support Point (memo, January 4, 1980) EPA, Federal Activities Coordinator, Atlanta, Georgia.

Malde, H. E., 1959. Geology of the Charleston Phosphate Area, South Carolina. U.S. Geological Survey Bulletin No. 1079.

Park, A. D., 1979. Ground water in the Coastal Plains Region: A Status Report and Handbook. Coastal Plains Regional Commission, Charleston, South Carolina.

Park, A. D., 1983. Comparison of Water Quality with Depth in Tertiary Limeston Aquifer, Charleston County. Palmetto Waters (monthly publication). SCWRC, Vol. 7, No. 2.

Park, A. D., and Stefanori, C. M., 1982. Water Level Recovery in the Charleston Area. Palmetto Waters (monthly publication), Vol. 6, No. 10.

Siple, G. E., 1967. Salt-Water Encroachment in Coastal South Carolina. South Carolina Division of Geology Geologic Notes, Vol. 11, No. 2.

Siple, G. E., 1975. Ground-Water Resources of Orangeburg County, South Carolina. South Carolina Division of Geology Bulletin No. 36.

South Carolina Department of Health and Environmental Control, 1981. Water Classification Standards System for The State of South Carolina. Regulation 61-68.

South Carolina Department of Health and Environmental Control, 1983. Storet Retrieval of Surface-Water Quality Data (June 17, 1983). SCDHEC, Stream and Facility Monitoring Section, Environmental Quality Control.

South Carolina Water Resources Commission, 1972. Ashley-Combahee-Edisto ("ACE" River Basin Framework Study. SCWRC Report No. 113.

South Carolina Water Resources Commission, 1974. Cooper River Environmental Study. SCWRC Report No. 117.

South Carolina Water Resources Commission, 1979. Cooper River Controlled Low-Flow Study. SCWRC Report No. 131.

Stringfield, V. T. and LeGrand, H. E., 1966. Hydrology of Limestone Terranes in the Coastal Plain of the Southeastern United States. Geological Survey of America Paper No. 93.

Stuck, W. M., 1983. Charleston Air Force Base Soil Series Descriptions and Interpretations (Preliminary Data). U.S. Department of Agriculture, Soil Conservation Service.

Talts, A. and others, 1976. Discovery, Containment and Recovery of a Jet Fuel Storage Tank Leak--A Case History. U.S. Army Environmental Hygiene Agency.

USAF, Charleston AFB, 1975. TAB A-1, Environmental Narrative, Charleston Air Force Base, Charleston, South Carolina.

USAF, Charleston AFB, 1982. Land Management Plan for Charleston AFB, South Carolina.

USAF, Charleston AFB, 1982. Environmental Quality Award Nomination. Charleston AFB, Charleston, South Carolina.

USAF, Charleston AFB, 1983, Water Utility Operating Log (General) for January, February and March, 1983. Charleston Air Force Base, Charleston, South Carolina.

USDA, Soil Conservation Service, 1971. Soil Survey of Charleston County, South Carolina.

USDA, Soil Conservation Service, 1983. Soil Survey of North Auxiliary Air Field, South Carolina (Preliminary).

U.S. Defense Fuel Supply Center, 1982. Environmental Hydrogeological Study of Defense Fuel Support Point, Charleston, South Carolina. Prepared by Dames and Moore Consulting Engineers, Boca Raton, Florida. Project CHS 80-16.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1963. Rainfall Frequency Atlas of the United States, Technical Paper No. 40.

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1977. Climatic Atlas of the United States.

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Federal Emergency Management Agency, 1976. Flood Insurance Study for Charleston County, South Carolina (Unincorporated Areas).

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Federal Emergency Management Agency, 1977. Flood Insurance Study for Berkeley County, South Carolina (Unincorporated Areas).

U.S. Department of Housing and Urban Development, Federal Insurance Administration, Federal Emergency Management Agency, 1980. Flood Insurance Study for Orangeburg County, South Carolina (Unincorporated Areas).

Willahby, R., 1983. Personal Communication (July 8, 1983). South Carolina Division of Geology. Columbia, South Carolina.

APPENDIX K

GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

APPENDIX K

GLOSSARY OF TERMINOLOGY AND ABBREVIATIONS

ABG: Air Base Group

AF: Air Force

AFB: Air Force Base

AFCS: Air Force Communications Service

AFFF: Aqueous Film Forming Foam, a fire extinguishing agent

AFR: Air Force Regulation

AFS: Air Force Station

AFSC: Air Force Systems Command

AGE: Aerospace-Ground Equipment

AMS: Avionics Maintenance Squadron

ANG: Air National Guard

APS: Aerial Port Squadron

ARTESIAN: Ground water contained under hydrostatic pressure significantly greater than atmospheric. The water level in an artesian well stands above the top of the artesian water body it taps

AQUIFER: a geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs

AVGAS: Aviation Gasoline

BASALT: A dark-grey to black, fine-grained igneous rock.

BEE: Bioenvironmental Engineer

CAFB: Charleston Air Force Base

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act

CES: Civil Engineering Squadron

CIRCA: About; used to indicate an approximate date

CLASS A WATER: Freshwaters suitable for primary contact recreation

CLASS B WATER: Water suitable for secondary contact recreation and as a source for drinking water supply after conventional treatment in accordance with the regulations of the SCDHEC. Suitable for fishing, survival and propagation of fish, and other flora and fauna. Suitable for industrial and agricultural uses.

CLASS SC WATER: Tidal salt waters suitable for secondary contact recreation, crabbing, and fishing, except harvesting of clams, mussels, or oysters for market purposes or human consumption. Also suitable for the survival and propagation of marine fauna and flora.

COD: Chemical Oxygen Demand, a measure of the amount of oxygen required to oxidize organic and oxidizable inorganic compounds in water

COE: Corps of Engineers

CONFINING BED: A body of impermeable material stratigraphically adjacent to one or more aquifers

CONTAMINATION: The degradation of natural water quality to the extent that its usefulness is impaired; there is no implication of any specific limits since the degree of permissible contamination depends upon the intended end use or uses of the water

DET: Detachment

DFSA: Defense Fuel Supply Agency

DFSP: Defense Fuel Support Point

DISPOSAL FACILITY: A facility or part of a facility at which hazardous waste is intentionally placed into or on land or water, and at which waste will remain after closure

DISPOSAL OF HAZARDOUS WASTE: The discharge, deposit, injection, dumping, spilling, or placing of any hazardous waste into or on land or water so that such waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground water

DOD: Department of Defense

DOWNGRADIENT: In the direction of lower hydraulic static head; the direction in which ground water typically flows

DPDO: Defense Property Disposal Office, formerly Redistribution and Marketing

DUMP: An uncovered land disposal site where solid and/or liquid wastes are deposited with little or no regard for pollution control or aesthetics; dumps are susceptible to open burning and are exposed to the elements, disease, vectors and scavengers

EFFLUENT: A liquid waste discharge from a manufacturing or treatment process, in its natural state, or partially or completely treated, that discharges into the environment

EOD: Explosive Ordnance Disposal

EP: Extraction procedure, the EPA's standard laboratory procedure for leachate generation

EPA: Environmental Protection Agency

EROSION: The wearing away of land surface by wind, water or chemical processes

FAA: Federal Aviation Administration

FACILITY: Any land and appurtenances thereon and thereto used for the treatment, storage and/or disposal of hazardous wastes

FELDSPATHIC: Containing feldspar, an aluminum silicate mineral

FIS: Fighter Interceptor Squadron

FLOW PATH: The direction or movement of ground water as governed principally by the hydraulic gradient

FMS: Field Maintenance Squadron

FPTA: Fire Protection Training Area

GATR: Ground/Air Transmitter-Receiver Site

GC/MS: Gas chromatograph/mass spectrophotometer, a laboratory procedure for identifying unknown compounds

GNEISS: A coarse-grained, banded, metamorphic rock

GROUND WATER: Water beneath the land surface in the saturated zone that is under atmospheric or artesian pressure

GROUND-WATER RESERVOIR: The earth materials and the intervening open spaces that contain ground water

GPD/FT: Gallons per day per foot

GPM: Gallons per minute

HALON: A fire extinguishing agent

HARDFILL: Disposal sites receiving construction debris, wood, miscellaneous spoil material

HARM: Hazardous Assessment Rating Methodology

HAZARDOUS WASTE: As defined in RCRA, a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed. The South Carolina Hazardous Waste Management Act uses this definition, but also defines waste oils as hazardous wastes.

HAZARDOUS WASTE GENERATION: The act or process of producing a hazardous waste

HEAVY METALS: Metallic elements, including the transition series, which include many elements required for plant and animal nutrition in trace concentrations but which become toxic at higher concentrations

Hg: Chemical symbol for mercury

HQ: Headquarters

HWMF: Hazardous Waste Management Facility

INCOMPATIBLE WASTE: A waste unsuitable for commingling with another waste or material because the commingling might result in generation of extreme heat or pressure, explosion or violent reaction, fire, formation of substances which are shock sensitive, friction sensitive, or otherwise have the potential for reacting violently, formation of toxic dusts, mists, fumes, and gases, volatilization of ignitable or toxic chemicals due to heat generation in such a manner that the likelihood of contamination of ground water or escape of the substance into the environment is increased, any other reaction which might result in not meeting the air, human health, and environmental standards.

INFILTRATION: The movement of water through the soil surface into the ground

IRP: Installation Restoration Program

JP-4: Jet Propulsion Fuel Number Four

LEACHATE: A solution resulting from the separation or dissolving of soluble or particulate constituents from solid waste or other man-placed medium by percolation of water

LEACHING: The process by which soluble materials in the soil, such as nutrients, pesticide chemicals or contaminants, are washed into a lower layer of soil or are dissolved and carried away by water

LINER: A continuous layer of natural or man-made materials beneath or on the sides of a surface impoundment, landfill, or landfill cell which restricts the downward or lateral escape of hazardous waste, hazardous waste constituents or leachate

LOAM: A soil consisting of varying proportions of clay, sand and organic matter.

MAC: Military Airlift Command

MATS: Military Air Transport Service

MEK: Methyl Ethyl Ketone

MGD: Million gallons per day

MOGAS: Motor gasoline

MONAZITE: A mineral occurring often in sand deposits; usually contains thorium.

Mn: Chemical symbol for manganese

MONITORING WELL: A well used to measure ground-water levels and to obtain water-quality samples

MSL: Mean Sea Level

MWR: Morale-Welfare and Recreation

NCO: Non-commissioned Officer

NCOIC: Non-commissioned Officer In-Charge

NDI: Non-destructive inspection

Ni: Chemical symbol for nickel

NPDES: National Pollutant Discharge Elimination System

OEHL: Occupational and Environmental Health Laboratory

OMS: Organizational Maintenance Squadron

OPNS: Operations

ORGANIC: Being, containing or relating to carbon compounds, especially in which hydrogen is attached to carbon

OSI: Office of Special Investigations

Pb: Chemical symbol for lead

PCB: Polychlorinated Biphenyl; liquids used as dielectrics in electrical equipment

PERCOLATION: Movement of moisture by gravity or hydrostatic pressure through interstices of unsaturated rock or soil

PMEL: Precision Measurement Equipment Laboratory

PERMEABILITY: The measure of the relative ease with which a porous medium can transmit a liquid under a potential gradient

PD-680: Cleaning solvent

pH: Negative logarithm of hydrogen ion concentration

PL: Public Law

POL: Petroleum, Oils and Lubricants

POLLUTANT: Any introduced gas, liquid or solid that makes a resource unfit for a specific purpose

POTENTIOMETRIC SURFACE: A surface which represents the static head. Pertaining to an aquifer, it is the level to which water will rise in tightly cased wells.

PPB: Parts per billion by weight

PRIME FARMLAND; South Carolina land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oil seed crops, as is available for these uses

PPM: Parts per million by weight

RCRA: Resource Conservation and Recovery Act

RECHARGE AREA: A surface area in which surface water or precipitation percolates through the unsaturated zone and eventually reaches the zone of saturation. Recharge areas may be natural or manmade

RECHARGE: The addition of water to the ground-water system by natural or artificial processes

SANITARY LANDFILL: A land disposal site using an engineered method of disposing solid wastes on land in a way that minimizes environmental hazards

SATURATED ZONE: That part of the earth's crust in which all voids are filled with water

SCDHEC: South Carolina Department of Health and Environmental Control

SCS: U.S. Department of Agriculture Soil Conservation Service

SCWRC: South Carolina Water Resources Commission

SLUDGE: Any garbage, refuse, or sludge from a waste treatment plant, water supply treatment, or air pollution control facility and other discarded material, including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, or agricultural operations and from community activities, but does not include solid or dissolved materials in domestic sewage; solid or dissolved materials in irrigation return flows; industrial discharges which are point source subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended (86 USC 880); or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954 (68 USC 923)

SOIL HORIZONS:

SOIL USE LIMITATIONS:

SLIGHT: Only a few limitations, if any, and these can be easily overcome.

MODERATE: Limitations are present and must be recognized, but it is practical to overcome them.

SEVERE: Limitations are difficult to overcome and therefore the suitability for the specified use is questionable.

VERY SEVERE: Limitations are so restrictive that it may not be practical to overcome them.

SPILL: Any unplanned release or discharge of a hazardous waste onto or into the air, land, or water

SS: Supply Squadron

STORAGE OF HAZARDOUS WASTE: Containment, either on a temporary basis or for a period of years, in such a manner as not to constitute disposal of such hazardous waste

STP: Sewage Treatment Plant

STATEWIDE IMPORTANT FARMLAND: In South Carolina land that is nearly prime farmland that will economically produce high yields of crops when treated and managed according to acceptable farming methods

TAC: Tactical Air Command

TACC: Tactical Air Control Center

TASS: Tactical Air Support Squadron

TCE: Trichloroethylene

TFW: Tactical Fighter Wing

THORIUM: A radioactive element occurring in certain minerals

TOC: Total organic carbon; an analytical parameter measuring the total organic content of a sample

TOX: Total organic halogen

TOXICITY: The ability of a material to produce injury or disease upon exposure, ingestion, inhalation, or assimilation by a living organism

TRANSMISSIVITY: The rate at which water is transmitted through a unit width of aquifer under a unit hydraulic gradient

TREATMENT OF HAZARDOUS WASTE: Any method, technique, or process including neutralization designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize the waste or so as to render the waste nonhazardous

TSD: Treatment, storage or disposal

UNCONFINED GROUND WATER: Water in an aquifer that has a water table

UPGRADIENT: In the direction of increasing hydraulic static head; the direction opposite to the prevailing flow of ground water

USAF: United States Air Force

USAFSS: United States Air Force Security Service

USGS: United States Geological Survey

USMC: United States Marine Corps

USN: United States Navy

VOC: Volatile organic carbon

WATER TABLE: Surface in an unconfined water body at which the pressure is equal to that of the atmosphere

Zn: Chemical symbol for zinc

APPENDIX L

APPENDIX L

INDEX OF REFERENCES TO POTENTIAL CONTAMINATION SOURCES